Augmenting Public Participation with Information Technology in a Portuguese Environmental Assessment Context

by

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ABSTRACT

This thesis explores the use of information technologies, such as the Internet, to facilitate public participation in Environmental Impact Assessment (EIA) in Portugal. Public participation in EIA in Portugal has been constrained by the characteristics of the process: decisions are made before the EIA starts and Environmental Impacts Studies (EISs) contain value judgments that are a source of conflict during the participation process. In Portugal, the public is only included in the later stages of the process, after the EIS is completed. In addition, the opportunity for public participation is poorly advertised and the EIS is difficult to access. Finally, the questions raised by the public are not answered adequately.

This thesis proposes the use of the Internet, and, more specifically, the World Wide Web (WWW) help resolve these problems. The characteristics of the WWW facilitate communication among the EIA stakeholders and also provides access to information. To take advantage of the WWW characteristics, this thesis provides a framework to design a WWW-based system to facilitate public participation in EIA in Portugal. Within this framework three models are described: the top-down dissemination model, the "watch-dog" model, and the interactive project formulation model. In the top-down dissemination model, a public agency uses the WWW as a way to disseminate EIA information. In the "watch-dog" model, diverse stakeholders use the WWW to disseminate their opinions about the information divulged by the public agency. In the interactive formulation project model, the stakeholders use the WWW to present their perspective about the project in order to produce a collaborative EIS.

As a planner, one should strive to implement the interactive project formulation model since it increases the influence of public participation in decision-making. However, the implementation of such a model implies a change in the way EIA process is organized and especially implies a change in the rationale for supporting public participation. In implementing such a model, the present and the future development of the Internet should be considered.

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TABLE OF CONTENTS

ABSTRACT 2
ACKNOWLEDGMENTS 3
TABLE OF CONTENTS 4
CHAPTER 1. INTRODUCTION 6
CHAPTER 2. PUBLIC PARTICIPATION WITHIN EIA: THE PORTUGUESE SITUATION 10
2.1 Introduction 10
2.2 Functions of Public Participation in EIA 11
2.3 Barriers to Public Participation 13
2.4 A Portuguese Perspective 14
2.4.1 The Public Participation Process 16
2.4.2 The Participants 20
2.4.3 Public Participation and Presentation of the Information 23
2.5 Major Findings 25
CHAPTER 3. THE USE OF INFORMATION TECHNOLOGIES TO FACILITATE PUBLIC PARTICIPATION IN EIA IN PORTUGAL 27
3.1 Introduction 27
3.2 Functions of Information Technologies in Public Participation in EIA 28
3.2.1 Access to EIA Information 29
3.2.2 Communication Among Stakeholders 30
3.2.2.1 One-to-one Media 30
3.2.2.2 One-to-many Media 31
3.2.2.3 Many-to-many Media 31
3.2.3 Presentation of the Information 32
3.3 Previous Work 34
3.4 Major Impediments for Using Information Technology 37
3.5 Summary 40
Chapter 4. STRATEGY OF INTERVENTION 42
4.1 Introduction 42
4.2 Design of a WWW-based System 43
4.2.1 Goals of a WWW-based System 43
4.2.2 Information to Be Included in the System 47
4.2.3 Structure of the System Information Gathering 49
4.2.4 Structure of the Information 52
4.2.4.1 Top-down Dissemination Model 54
4.2.4.2 "Watch-dog" Model 55
4.2.4.3 Interactive Project Formulation Model 57
4.3 Barriers to a WWW-based System 61
4.4 Summary 64
CHAPTER 5. APPLYING THE STRATEGY 65
5.1 Introduction 65

5.2 Development of the Prototype....65
5.2.1 Information Included in the Prototype....66
5.2.2 Application of the Interactive Project Formulation Structure....68
5.2.2.1 Location of the Project....70
5.2.2.2 Description of the Project....73
5.2.2.3 Characteristics of the Area....74
5.2.2.4 Impacts of the Project....75
5.2.2.2 Mitigation Measures....77
5.3 Major Difficulties....80
CHAPTER 6. CONCLUSIONS AND ISSUES FOR FURTHER RESEARCH....83
6.1 Conclusions....83
6.2 Research Issues....88
6.2.1 Implementation of the System....89
6.2.2 Sustainability of the Technology....90
6.2.3 Usage Characteristics and Evaluation of the System....92
BIBLIOGRAPHY....93

CHAPTER 1. INTRODUCTION

Environmental Impact Assessment (EIA) is a process conceived to ensure that a project, plan or policy is environmentally and socially sustainable. It was first introduced in the United States in 1969 with the National Environmental Policy Act (NEPA). Since then, EIA has been implemented around the world, in different ways, but always respecting the idea "look before you leap." Potentially, EIA can help to avoid mistakes that can be expensive in environmental, social and economic terms. EIA intends to support decision-making that usually belongs to the political arena by evaluating the possible impacts and tradeoffs of a specific action and a set of important alternatives. Decision-making is often the result of a balance among different interests. Therefore, one of the most important ideas behind EIA is to provide for the participation of all stakeholders (citizens, developers, decision-makers, environmental and cultural groups, and other public associations).

Public participation allows public values and interests to be incorporated into projects so that they are more suitable to the public's needs. The public can provide important information to the process since it is familiar with local issues. Public participation is a way to share the responsibility between decision-makers and individuals most affected by public actions. This allows for more stable outcomes and, therefore, a successful project implementation. However, public participation is not always easy to accomplish. Frequently, EIA is conducted after a decision is already made. Therefore, there is often resistance to considering alternatives to a proposed action. Under these circumstances, the process suffers from lack of credibility. As a result, public officials and stakeholders may look at public participation as a waste of time and money. Furthermore public participation may be difficult to implement institutionally. While, most of the existing EIA procedures throughout the world include provisions for some form of public participation, they differ in terms of stages where public participation is included and of techniques used.

In Portugal, the focus of this thesis, public participation in EIA has been limited to the later stages of the process. Typically, the public is only given the opportunity to react to a project after it has been defined, without being able to influence basic project design. To improve public participation in Portugal, it would be necessary to change the rationale for supporting public participation in EIA. For example, the public should be involved from the earliest stages of the process. EIA should be used as a tool to support decision-

making and not as a justification for a preconceived action. Only a change in the way public participation is organized will bring more credibility to the process. Nonetheless, according to members of environmental organizations, public participation, as it is organized now, is still a useful process that allows the public to better understand various aspects of the projects. It has also impelled changes in projects and decisions[1]. Yet, public participation, could be improved to enable a wider range of stakeholders to participate and more easily understand the information.

The major problems limiting public participation are related with the EIA characteristics: the decisions are made before the EIA starts and the Environmental Impact Studies (EISs) contains judgments values that are source of conflict during the participation process. In addition, two other problems currently constrain effective public participation in EIA in Portugal: access to EIA information and the way EIA results are presented. Access to EIA information, particularly to the EISs is usually restricted. EISs are available in the central government agency responsible for public participation, as well as in all municipalities affected by the project. These institutions usually allow access to the EIS only during regular office hours, that is from 9:00 AM to 5:00 PM, with access possibly restricted during lunch hours. This makes access to the EIS difficult for the public in general. In fact, people who have a regular work schedule might never have access to the study.

Another obstacle to public participation is how the information in the EIS is presented. It is usually difficult for the non-technical, and sometimes even for the technically literate public to understand the impacts of a project. For example, it may be difficult to understand the exact location of the project and appearance of a project, since, even under the best circumstances, the study will include only maps and technical drawings rather than three dimensional sketches or models.

My thesis explores the potential of using information technologies, more specifically the World Wide Web (WWW), to overcome these problems. In this thesis, I address how an environmental analysis system using the WWW can encourage meaningful discourse among stakeholders involved in the EIA process. With this work, I intend to acquire more knowledge on the design concepts involved in using information technologies in the planning context, such as the EIA process.

---

[1] During interviews with members of environmental associations, at least two cases were mentioned where, according to them, the action of environmental organizations has stopped the project: the extension of Setúbal Harbor and an urban development in Troia. This interviews were held in Lisbon, January 1996.

An environmental analysis system based on the WWW to facilitate public participation would allow access to the EIA information with minimal restrictions of schedule and geographical location. For example, if someone has a computer at home connected to the Internet, one can access information related to a specific project without having to go to a specific location. Furthermore, if EISs are available through the Internet multiple users can access an EIS at the same time.

Another potential advantage of the WWW is that it can facilitate the understanding of information presented in the EIS, through the use of images, videos and sounds. Previous research shows that the use of images and video can lead to better a understanding of information (Fonseca, 1995 and Shiffer 1995). In this thesis, I use images and videos to create more descriptive representations of the environment. For example, the perception of an airport impact on a neighborhood is directly related to the noise level. This impact can be more easily understood by using sounds, rather than by using numerical values representing sounds.

In addition, the Internet provides for two-way communication. This allows users of an environmental analysis system based on the WWW to ask questions or comment about the project and the EIS. Questions and answers can be accessible to every user of the system catalyzing the exchange of opinions on a given project. It also allows different stakeholders to present their own perspectives and to exchange information about a specific project.

In order to take advantage of the characteristics of the WWW, I propose three models of a WWW-based system to facilitate public participation: the top-down dissemination model, the "watch-dog" model and the interactive project formulation model. Each of these models have different goals and characteristics. The top-down model intends to use the Internet only as a new medium to dissemination information. The "watch-dog" model intends to allow diverse stakeholders, such as environmental organizations, to monitor the activities of the public agencies in the EIA process. This model assumes that the public agency responsible for coordinating public participation uses the WWW to disseminate EIA information. The interactive project formulation models intends to allow the different stakeholders, such as environmental organizations, proponent of the projects, and decision-makers, to present their perspective about a project in order to produce a collaborative EIS.

In the design of an environmental analysis system based on the WWW to facilitate public participation one has to consider the following issues: (1) What information should be included in the system? (2) What operations should a system like this include? and (3) Do relevant participants in EIA really have access to the Internet? These are issues that I discuss in the subsequent chapters of this thesis. I recognize that the willingness and the costs to implement such a system on the WWW should be considered. Although my thesis does not address these problems in depth, I believe that the exploration of the capabilities of an environmental analysis system based on the WWW can demonstrate benefits that the traditional ways of delivering and communicating information within EIA do not have, for instance, the possibility to have the multiple perspectives presented at the same time.

In the first chapter, I present an analysis of the role of public participation in EIA. I also characterize public participation within EIA in Portugal in particular and describe the main constraints. Next, I analyze how information technologies, more specifically the Internet, can be used to facilitate public participation in EIA. Then, I propose three models for an environmental analysis system based on the WWW to facilitate public participation. I give special relevance to the information and operations that should be included in the system. I then describe the development of a prototype to illustrate my proposed structure. Finally, I present my major conclusions and identify issues for further research that this investigation raises.

CHAPTER 2. PUBLIC PARTICIPATION WITHIN EIA: THE PORTUGUESE SITUATION

2.1 Introduction

The main goal of Environmental Impact Assessment (EIA) is to ensure that environmental quality is carefully considered in the planning and decision-making process. In the EIA process, an analysis is conducted to identify and evaluate the likely economic, social, aesthetic and environmental effects of a proposed action (activity, project or policy) and various reasonable alternatives (Rau and Wooden, 1980).

Within the assessment process, an Environmental Impact Study (EIS) is developed specifically to support decision-making. This document should be of sufficient detail to allow decision-makers, usually elected officials, to consider the probable impacts of important alternative versions of an action. In addition, the EIS should present technical information in a way that allows people with different technical backgrounds to understand what is involved.

The EIA process aims to provide information to the developer, the public and the decision-makers so they may conduct a more structured debate concerning the relative importance of each of these effects. Because all actions are evaluated before they are implemented, the EIA process is a precautionary tool that allows planners, decision-makers and the public to influence project definition and to encourage the consideration of less environmentally damaging alternatives. Ideally, EIA enables the decision-makers and various interests groups to work together to protect the quality of the environment (Berzok, 1986).

The value of EIA has been recognized in the United States with the National Environmental Policy Act (NEPA) passed in 1969. Since then, EIA systems have been implemented in various forms throughout the world. In the European Community (EC), EIA has been implemented as a tool to ensure that environmental protection is taken into account by all Member States. EIA was introduced into Portugal's legal system with the adoption of the EC Directive (85/337/EEC) that established procedures for EIA.

In this chapter, I begin to describe the role of public participation in EIA and to identify the major barriers that hinder effective participation. Then, I describe the status of public participation in EIA in Portugal. I give a more detailed description of how the public

participation process is organized in Portugal, who participates in it and how information included in the EIS is presented. I then conclude with a brief summary of my major findings.

2.2 Functions of Public Participation in EIA

One of the most important objectives of EIA is to provide public access to decision-making. Most of the existing EIA procedures throughout the world include provisions for some form of public participation. However, the stages where public participation is included and the techniques used vary from country to country. The role that the public plays in EIA depends, on the requirements of the impact assessment legislation, the degree to which the lead agency welcomes public input and public access to financial resources (Berzok, 1986). Other factors that determine the role of the public in each country are the level of implementation of EIA as well as the cultural and political attitudes (Clark, 1994).

Depending on the EIA process, public participation can accomplish at least three different objectives as identified by Gariepy (1991):

- It can make decision-makers more accountable to the public.
- It can identify additional considerations that are relevant to the process.
- It can incorporate the public's values and preferences into a project. This function is especially useful when comparing alternatives.

However, depending on how seriously citizen concerns and ideas are taken into account, public participation in EIA does not always accomplish these three objectives. According to Arnstein (1969), to achieve meaningful public participation, it is necessary to have redistribution of power among the participants. Public participation can occur at different levels and have different impacts. Citizen participation can be a formalistic ritual that aims only to comply with legal requirements, it can be a strategy to pacify citizens or an empowering process by which citizens effectively influence decisions. Although public participation is potentially a positive process, if it fails to redistribute power among all the stakeholders, it can be a source of anger, frustration and disillusionment.

Public and elected officials support public participation in EIA are either philosophical or pragmatic reasons. Susskind (1977) identifies a set of reasons that public

and elected officials support public participation in the planning process. This set can also be applied to the EIA:

- Public participation is a prerequisite to developing a specific action either because there is a legislative demand or because there is some financial aid at stake. In this situation, some public officials do not see any value in having public participation in the process, but they are forced to involve the public.

- The public can provide information important to the process since it is very familiar with the area. Also, it is important to know and to be able to incorporate the public's values and interests into the project in order to develop a project more suitable to the public's needs.

- Public participation can be used to generate support for public action. Some public officials believe that in order to facilitate the implementation of certain projects, it is important to have the public accept the project.

- Public participation is a way to share the responsibility between the decision-makers and the individuals most affected by public actions. This would allow for more stable outcomes and, therefore, a more successful implementation of the projects.

Traditionally, public participation has been conceived as an opportunity, provided by the decision-makers, to comment on projects prepared by consultants or experts (Susskind, 1976). Therefore, public participation has been reactive; citizens are invited, usually at late stages of the process, to comment on proposed actions without being able to define the actions to begin with. Public participation is an advisory process where there is no assurance that it will change the decision. This fact makes citizens skeptical about the process.

Another drawback of this model of public participation is that it assumes that the public has a substantial prior knowledge of the project. This is especially important since public participation in EIA involves the understanding and analysis of technical information. Usually, citizens do not get the information and support they need since this model of public participation often relies only on public hearings. Such hearings are at best formalistic and intimidating; and as a result they discourage participation. They are not trusted by citizens. Thus, an effective exchange of information is not allowed (Ortolano, 1984). In this type of model, citizens use EIA, mainly, as a source of information to challenge a project on legal or political grounds.

However, according to Berzok (1986), agencies are becoming more willing to give a real role to the public, especially when the process is managed by professionals. The existence of an institution that is exclusively responsible for managing public participation has been identified by Berzok (1986) as a key factor in achieving an effective process. In these types of processes, citizens are involved from the early stages, allowing them to influence project definition. Mechanisms that allow two way communication, such as informal workshops and small meetings, are the preferred way to involve citizens (Ortolano, 1984). Public workshops allow for the presentation and discussion of project definitions, the views and interests of the public, as well as the views of the sponsor.

2.3 Barriers to Public Participation

Although the attitude of some agencies has changed, public participation is still difficult to implement. The characteristics of the EIA process and the availability of resources such as time and money are the main obstacles to implementing an effective public participation process.

Frequently, EIA is conducted after a decision is already made. According to Berzok (1986) agencies perceive their objectives within a very narrow context and projects are defined accordingly. Therefore, there is often resistance from agencies to considering alternatives to a proposed action. Under these circumstances, the process suffers from lack of credibility. Thus, public officials and citizens, may look at public participation as a waste of time and money.

EIA involves the presentation of technical information that supports decision-making. The development of an EIS should involve an analysis of various environmental and social-economics considerations such as air quality and demographics, as well as an assessment of the impact a project might have on these factors. For instance, the impact of a chemical plant on water quality involves a study of the effects of contamination on people, fish, algae and sediment, as well as an assessment of the effects according to the uses of that water. This process requires a subjective evaluation of the information, especially in the process of amalgamating and presenting the impacts of a specific project. If an EIA is not transparent, with active public participation, the subjectivity involved in evaluating and presenting information is not explicit. For example, one Portuguese environmentalist has complained that "usually, the matrix of impacts, which could be used to screen the major impacts of a project, is biased. It does not show the most important

impacts of the project, described in the text."[2] In certain countries such as Portugal, the difficulty of developing and supporting analysis is increased by a lack of environmental data. However, according to Berzok (1986), the process of debating the quality of technical information and analysis is subordinate to public acceptance of the project definition.

The structure of an EIS should address the difficulty of transmitting technical information to a public with various levels of knowledge. Basically, the EIS is divided into two main parts: a non-technical summary and the technical report. The main purpose of the non-technical summary is to make information more accessible to the general public. Therefore, such a summary should indicate the consequences of different alternatives (such as building the project or not building it) and should avoid technical jargon. However, it is usually difficult for the non-technical, and sometimes even for the technical, public to understand the impacts of a project. For example, it may be difficult to understand exactly where a project is going to be located and how it is going to look, since, even under the best circumstances, the study will include only maps and technical drawings (rather than three dimensional sketches or models).

The public's access to resources can affect the degree to which they can influence an impact assessment. The organization of the public involves communication and coordination activities such as communication among the public or with other stakeholders such as the press. These activities require time, money, and physical and mental efforts. These are important resources when the public is trying to get involved in a process for which they have received no invitation. When the public has resources, it tends to turn to litigation. By using litigation public actions usually get more attention from the media and, therefore, they are more prone to produce some political pressure. The lack of credibility of the EIA process also influences the public to turn into litigation. However, in certain cases, if processes such as negotiation were initiated the public could ensure they would become part of the decision-making process, or the public could ensure the adoption of control measures.

2.4 A Portuguese Perspective

The concept of EIA was introduced into Portugal's legal system in 1990 with a European Community Directive that established an EIA procedure (85/337/EEC). Since

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[2] Comment made by Francisco Ferreira, member of *Quercus* ,a national environmental organization, in an interview held in Lisbon, January 1996.

that time, specific types of public and private projects, such as bridges, dams, roadways and airports, have been required to undergo an environmental assessment. According to the Directive, the EIS should be available so the public can have an opportunity to express opinions before the project is initiated. It also states that the public must be informed of the decision about the project and explain the reasons for that decision (Clark, 1994). However, the laws that outline the EIA process in the Portuguese legal system, DL 188/90 and DR 38/90, follow only the minimum requirements of the EC Directive. Moreover, they only vaguely describe public participation procedures. The DL 188/90 states that

> the entity responsible for coordinating the EIA process [the Ministry for the Environment and Natural Resources]...is responsible for promoting participation of the interested public in order to allow for a wide participation of interested entities and citizens in evaluating a project. ...Public participation assumes a previous disclosure of developed studies as well as an explanation of the more important issues in the project ...The final decisions should also be accessible to the public.

The DR 38/90 is more specific and defines the interested public:

> For effects of participation the interested public is constituted by:
>
> a) Citizens, non-governmental organizations namely environmental organizations, as well as municipal governments of the affected region if they have not participated in the project, for projects included in Annex I...
>
> b) Local towns, where the project is going to be implemented, as well as adjacent towns, citizens and citizen's organizations, for projects included in Annex III...

It also indicates the information that should support public participation:

> Public participation is activated by the dissemination of a Non-Technical Summary given by the proponent of the project...
>
> Within public participation the comments and reclamations, presented in a written format, will be considered and analyzed.

Typically, in Portugal, public participation is limited to the following: the EIS is made available to the public and the public's reactions are gathered and compiled. Although an effort is usually made to incorporate some of the comments into final decisions, DL 188/90 and DR 38/90 are vague in how public comments are going to be analyzed and used in the decision-making process. These laws do not specify how to disseminate the information to the public and who is responsible for coordinating public participation. They also do not provide for mechanisms to make final decisions accessible

to the public. According to Raposo (1995), it is difficult to find the final decision in many projects.

In Portugal, the public begins to participate only in the later stages of the EIA process, shortly after the submission of the EIS. In contrast, in other countries in the EC, such as the Netherlands, where EIA procedures are well developed, public participation begins early in the scoping stage of a project and continues even beyond submission of the EIS. To be more effective, public participation in Portugal should influence decisions and help teach the public and decision-makers how to deal with situations where different interests are at stake.

To better understand the effects of public participation in EIA in Portugal, I discuss first, how the public participation process is organized; second, who participates; and third, how information is presented to the public.

2.4.1 The Public Participation Process

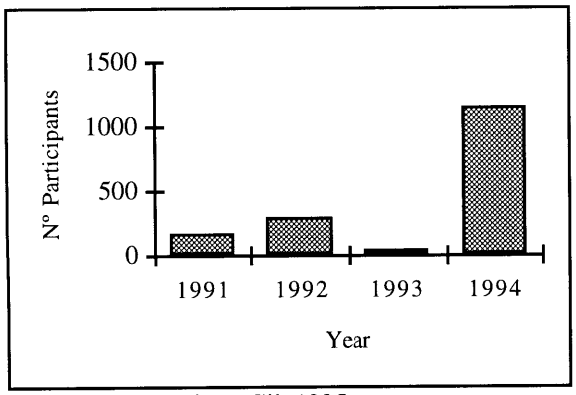
In Portugal, the defining laws, DL 188/90 and DR 38/90, divide the EIA process into two main components: the evaluation of the EIS and public participation. A technical commission, composed of representatives of government agencies with responsibilities in the environmental arena, performs an evaluation of the EIS. For example in the EIA of the Vasco da Gama Bridge,[3] the technical commission was composed of representatives of the Institute for Environmental Promotion (IPAMB), the General Directorate for Environment (DGA), the Institute for Nature Preservation (ICN), the National Water Institute (INAG), the Regional Directorate for Environment and Natural Resources (DRARN) and the Commission for Regional Coordination (CCR).

Public participation, as defined by law, consists almost exclusively of access to the EIS for a limited period of time (between 20 and 60 days according to the type of project). In the Vasco da Gama bridge EIA, public participation occurred for a period of 40 days. This period was extended by 15 days in order to allow for wider participation. During the time an EIS is available, the public can comment on the project and on the EIS. At the end of this period, the institution responsible for coordinating public participation has 5 days to produce a report summarizing public reactions. This report, along with the report produced

[3] This bridge is to be built over the Tagus river in Lisbon. The EIA for this project took place between July and September 1994. The construction of the bridge has started in October 1994.

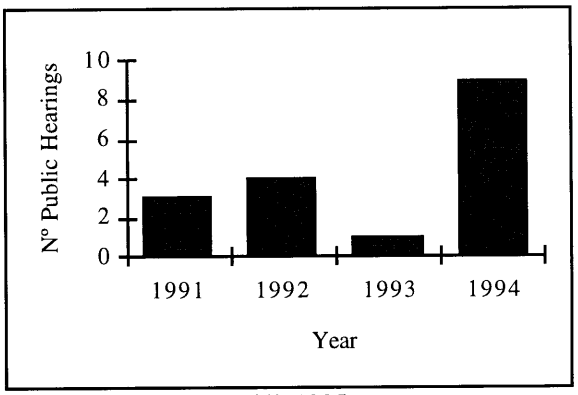
by the technical commission of EIA, is sent to the elected official responsible for deciding on the project.

Since the end of 1993, the public participation process has been managed by the Institute for Environmental Promotion (IPAMB), a government agency, which is under the umbrella of the Ministry for the Environment and Natural Resources. Since IPAMB became responsible for managing public participation, the number of public hearings and the number of citizens involved have increased substantially (Fig. 2.1 and Fig 2.2)(Gil, 1995). This underlines the importance of having an institution that is exclusively responsible for managing public participation, as previously identified by Berzok (1986). The strong correlation observed between the number of participants and the number of public hearings can change if the public has alternative ways to participate in the EIA process.



Source: Adapted from Gil, 1995

Figure 2.1 Number of participants in Portuguese EIA between 1991 and 1994



Source: Adapted from Gil, 1995

Figure 2.2 Number of public hearings in Portuguese EIA between 1991 and 1994

It is worth better characterizing how the responsibility to coordinate public participation was attributed to IPAMB. Before IPAMB took this task, public participation was managed by whichever agency was responsible for coordinating the technical commission for EIA, and the agency would differ according to the type of project. Therefore, public participation was not sufficiently organized and no learning process existed that would allow it to improve. The EIA experience in Portugal has shown that public participation was conditioned by the institution responsible for coordinating that process. The responsibilities of each institution as well as the importance its representatives give to public participation determine the efforts that each institution puts into organizing public participation.

In order to improve the process, the Ministry for the Environment and Natural Resources, during a restructuring process, created a division in IPAMB to coordinate public participation. IPAMB was the entity more qualified to take that role since its main responsibility is to support environmental organizations and to promote environmental education. The attribution of this role to IPAMB was considered by its president as a way to improve IPAMB's prestige.[4]

Two environmental engineers and one anthropologist have been hired to work in the division for public participation in EIA, which is supervised by a civil engineer with previous experience in environmental education. The increase of responsibilities have not been supplemented by any increase in IPAMB's budget. Therefore, the organization of public participation struggles with lack of resources, especially of human resources since the existent ones are considered insufficient for the current volume of work. In addition, the evaluation of specific types of projects requires expertise in areas that the current staff does not have.

Due to the restructuring, IPAMB has a double role: it is responsible for coordinating public participation and it is a member of the technical commission. This double role allows IPAMB to take public comments in the EIS evaluation process. The report produced by the technical commission includes a section summarizing the public participation process where IPAMB includes the considered relevant public comments and defines the commission's position on those comments. For example, referring to the Vasco da Gama Bridge the report states that "within the public participation process it was noted that the EIS did not characterize well the impacts on the natural ecosystems. Therefore, the technical commission proposes additional studies in this area."[5] This is very important since, according to Raposo (1995), most of the decisions made by the Ministry for the Environment and Natural Resources are in consonance with the report produced by the technical commission.

IPAMB also tries to influence the other members of the technical commission to consider public comments in their evaluation of the EIS. According to one member of the IPAMB staff, in the beginning there was some resistance by some members of the technical commission to considering the public's comments. However, this attitude is changing and they begin to consider public knowledge and opinion as an important source of information.

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[4] IPAMB, Lisbon interviews with selected members, January 1996.
[5] Technical report of the EIA for the Vasco da Gama da Bridge, accessible at IPAMB, Lisbon, October 1994.

Considering the way public participation is defined, organizational problems limit public participation such as lack of public awareness of an ongoing EIA, limited access to the EIS and inefficient answers to public questions.

Public participation is restricted not only to the period of time that the EIS is available but also by the extent of the public awareness that the EIS was completed. The process of divulging an EIA is very formal and in most cases considered ineffective by both the administration and environmentalists. IPAMB sends copies of the non-technical summary to national and local environmental organizations, unions, local associations, local mass media and local authorities. It also announces the existence of an EIA in national and local newspapers as well as on local radio.

The environmentalists complain that the administration does not put enough resources into providing information to the mass media, and if the media participates in the EIA process, it is only because of the action of environmental groups.[6] Another complaint made by environmentalists is that there are few announcements in the local media. On the other hand, IPAMB complains that they send information to the media, but the media does not pay attention to it and does not divulge the information sent by IPAMB. According to one member of IPAMB, this problem extends to local governments and other institutions that are invited to participate. She referred to cases of municipalities that send back the studies to IPAMB since they do not know what to do with them. [7]

The EIS is accessible only at the IPAMB office, as well as in all municipalities affected by the project. These institutions usually allow access to the EIS only during regular office hours, that is, from 9:00 to 5:00 PM, with access restricted during lunch hours. This makes access to the EIS difficult for the public; for example, people who have a regular work schedule cannot have access to the study. To make the situation worse, only a single document is available in each of the locations.

People with technical backgrounds, such as university professors and members of national environmental associations, are the ones who have voiced concerns about the difficulty of accessing EISs. In general, other organizations that do not have technical staff, such as regional environmental organizations, limit their evaluation of the project to the Non-technical Summary.[8]

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[6] Based on interviews with members of environmental organizations that usually participate in EIA.

[7] Comment made by Diana Pereira, staff of IPAMB in an interview held in Lisbon, January 1996.

[8] Based on interviews with members of environmental organizations that usually participate in EIA.

Another obstacle to public participation is that the mechanism used for answering public questions is to promote public hearings. Public hearings are organized only if the IPAMB considers them necessary, that is, when the dimensions or scope of the project are such that there is a strong public opposition to the project, and the public is sufficiently organized to be able to contest the project and request a public hearing. In order to answer public questions in the public hearings a representative of the technical commission, two representatives of the IPAMB, a representative of the proponent and representatives of the EIS team attend to the meeting. A transcript of the public hearing is included in the public participation report.

There have been only 31 public hearings between January of 1990 and May of 1995 (Gil, 1995). In the case of the Vasco da Gama bridge EIA, there were two public hearings, each with an average of 200 participants. From the transcription of the hearings, it is obvious how this process is confusing and does not inform the public conveniently: a citizen complained that "these sessions are not intended to clarify the information for specialists, but to clarify the citizens' legitimate interests."[9] Public hearings do not inspire confidence in the process. One environmentalist asked, "What are we doing here?"[10] The same person in a personal interview stated, "We [environmental organization] are not in the habit of going to public hearings; we think we have more effect if we send the comments directly to IPAMB and also to the press."[11] The general feeling is transmitted by another comment made also in a public hearing for the Vasco da Gama bridge, "In reality these sessions are *pro forma*, but at least they could be helpful to clarify certain aspects."[12]

2.4.2 The Participants

Between January of 1990 and May of 1995, only 218 of the 307 projects that produced EIAs have had public participation (Gil, 1995). Even though the number of comments sent in by the public has increased, the comments are relatively few and reflect whether a project is at the local, regional or national scale. For example, in the EIA for the Vasco da Gama Bridge, which is a project with implications at the regional level, only 12 written comments arrived. These comments came from different segments of the

[9] Comment made by a non identified citizen during a public hearing for the Vasco da Gama Bridge held in Portela, September 1994, cited in the transcript of the public hearings accessible at IPAMB, Lisbon, October 1994.
[10] Comment made by Francisco Moreira, member of LPN a national environmental organization during a public hearing for the Vasco da Gama Bridge held in Portela, September 1994, cited in the transcript of the public hearings accessible at IPAMB, Lisbon, October 1994.
[11] Comment made by Francisco Moreira, member of LPN, in an interview held in Lisbon, January 1996.
[12] Comment made João Joanaz, member of GEOTA, a national environmental organization during a public hearing for the Vasco da Gama Bridge held in Portela, September 1994, cited in the transcript of the public hearings accessible at IPAMB, Lisbon, October 1994.

population, such as citizens affected by the project, local associations, local governments and environmental groups at national and European levels. Some of these comments included petitions.

The participation of different groups reveals their concerns. The comments made by representatives of each group, during the public hearings of the Vasco da Gama Bridge, illustrate the differences. Citizens affected by a project are usually worried about their own resources and life styles as illustrated by this comment: "I live in a third floor and I would like to know if I can still sleep in my own home when the bridge is finished." Local associations are more concerned about preserving local resources and promoting local development as this comment made by a representative of a local association shows: "Of all the negative aspects, the one that worries me most is the real estate pressure to develop the land." Local governments are interested in showing to the population that they take care of the population's interests. For example the president of one municipality stated, "We now have a tool, the master plan, which will prevent us from making the mistakes made in the past."[13] Local governments also take the opportunity to criticize or support the project; for example one Mayor said, "I want to express here, a big concern about relocating the population."[14] National environmental organizations are worried about promoting a balanced development. For example, one environmentalist said, "It is our understanding, that the Vasco da Gama Bridge has to be evaluated as a piece of the transportation system over the Tagus, which is a part of the development of the metropolitan area ."[15] They also complain about how the EIA process is defined and organized. For example, the comments of environmentalists include, "We support a new bridge over the Tagus, but not this alternative... There is no technical support for selecting this alternative..."[16] and "I want to know who is responsible for refusing access to additional elements of the EIA process to the environmental organizations."[17]

In general, citizens such as environmentalists, union activists and university professors have been involved in the public participation process, but it is the people who

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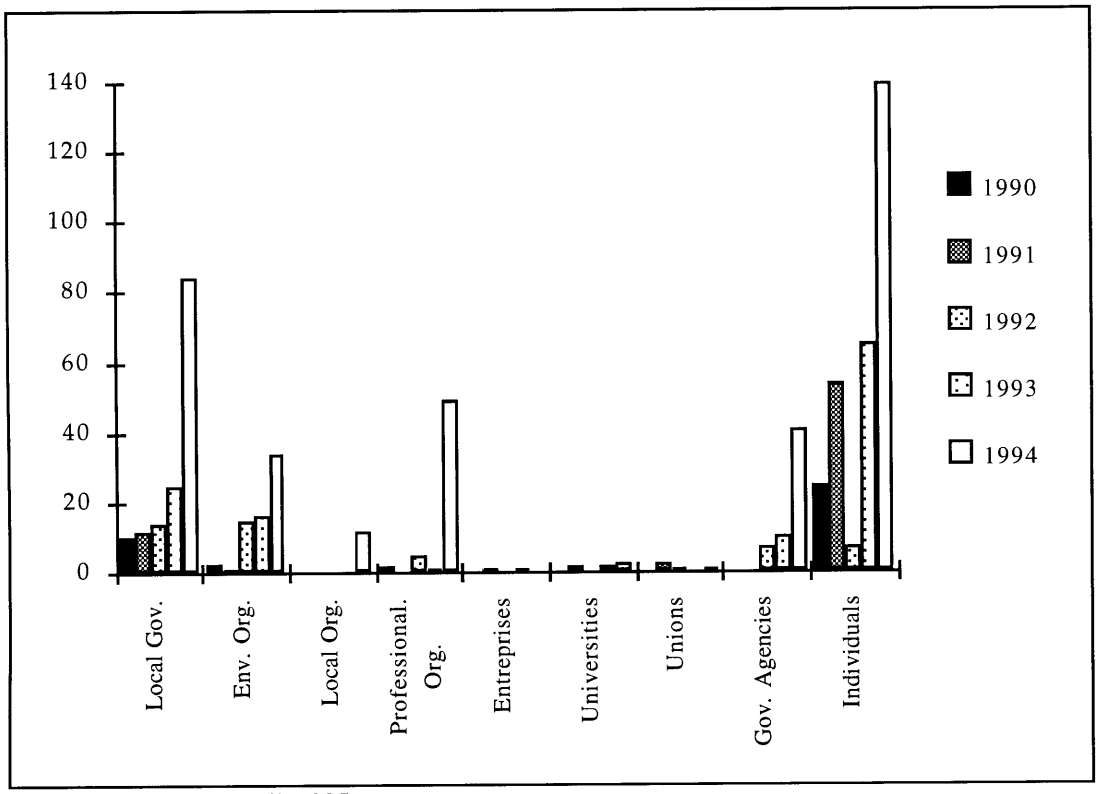
13 Comment made by the Mayor of Montijo during a public hearing for the Vasco da Gama Bridge held in Alcochete, September 1994, cited in the transcript of the public hearings accessible at IPAMB, Lisbon, October 1994.
14 Comment made by the Mayor of Loures during a public hearing for the Vasco da Gama Bridge held in Portela, September 1994, cited in the transcript of the public hearings accessible at IPAMB, Lisbon, October 1994.
15 Comment sent to IPAMB by the national environmental organizations in the Vasco da Gama Bridge EIA. Included in public participation report accessible at IPAMB, Lisbon, October 1994.
16Comment made by João Caninas, member of GEOTA, during a public hearing for the Vasco da Gama Bridge held in Alcochete, September 1995, cited in the transcript of the public hearings accessible at IPAMB, Lisbon, October 1994.
17Comment made by João Joanaz, member of GEOTA, during a public hearing for the Vasco da Gama Bridge held in Portela, September 1995.

are directly affected by the project that make up the largest proportion of participants (Figure 2.3). This is not surprising, considering that the Portuguese Central Administration's main concern, related to public participation, is to ensure the right of the public directly affected to contest the project (Caixinhas and Chito, 1993). Sectors of the population that could have interests at stake or that have substantial knowledge to offer, such as environmental organizations and universities, are not necessary involved in the process. However, in the Vasco da Gama Bridge project, the distribution of each group differed from the general case. Of the 12 comments received, 6 were from associations and 2 from local governments; only 4 were from affected citizens.



Source: Adapted from Gil, 1995

Figure 2.3 Participants in Portuguese EIA grouped by different sectors of the population, between 1990 and 1994

Another characteristic of EIA participants in Portugal, is that most of the citizens are from rural areas[18] since most urban projects are not legally required to undergo an EIA process. In addition, most of the projects that have been submitted to EIA (such as roadways, small dams and industries) are located outside urban areas. In contrast, in the

[18] Based on an interview with Helder Gil, coordinator of IPAMB's Division for Public Participation in EIA, held in Lisbon, January 1996.

Vasco da Gama Bridge EIA most of the affected citizens were from urban areas since it affects the metropolitan area of Lisbon .

The relatively strong participation of environmental organizations in the Vasco da Gama Bridge EIA is due to the regional scale of the project and its effect on an important natural area. These two strong reasons motivate national environmental organizations to participate. Environmental organizations struggle with lack of human and financial resources. Therefore, they have to select the projects in which they can participate. The selection criteria are generally the geographical locations of the projects and their perceived significance in terms of environmental impacts. Environmentalists select projects on the basis of information either in the non-technical summary or in a personal warning about negative impacts in the environment.

Usually, environmental organizations analyze the EIS and produce a comment critiquing the project and the EIS. This comment is sent to IPAMB as well as to the media and other institutions, such as government agencies, in order to produce some political lobbying. According to one environmentalist, "It is necessary to do some political lobbying since the decision is based on political grounds. Acting in this fashion, sometimes, is possible to modify the project or even stop it."[19] In the case of the Vasco da Gama da Bridge all national environmental organizations got together and produced a single comment that was widely published in the media. This comment criticized the project, the EIS and both the political and decision-making process. In this case, environmental organizations also made use of other mechanisms like mobilizing the affected population to protest, and presenting a complaint to the Administrative Court. However, the political decision had already been made and since this was a project where the financial and political stakes were very high, the bridge was approved.

2.4.3 Public Participation and Presentation of the Information

The way information is presented affects public understanding of the problems as well as the capacity to engage the public to participate. Although the complete EIS and other documents considered relevant for understanding the project are publicly available, the non-technical summary is the document used to support public participation. The non-technical summary is used as a primary source of information by citizens and local associations, and it is used by environmental associations to select the projects in which they want to be involved. The non-technical summary indicates both the principal

19 Comment made by Francisco Ferreira, member of Quercus, in an interview held in Lisbon, January 1996.

characteristics of a project and its main impacts. Public participation starts only when IPAMB considers that the non-technical summary includes the most important impacts and is written in a way that is easily understood.

The non-technical summary, in most cases, follows the structure of the study: it begins by describing the baseline conditions, the project characteristics, the project's impacts and the proposed mitigation measures. Some studies present the non-technical summary in the form of questions and answers. For example, in the case of a proposed urban development in Troia, the non-technical summary includes the following questions: What is the development? What are the characteristics of the area? What are the development's impacts? And where is it possible to implement control measures in order to minimize the negative impacts?

In many cases, the information presented in non-technical summaries still uses technical language. For example, on the Vasco da Gama da Bridge EIA, the non-technical summary describes the viaducts as following: "the cut and fill for the viaducts will measure 6 to 8 meters and the embankment will have a slope of 1:1.5 (v:h)." Therefore, a citizen in a public hearing asked, "I would like to know in terms of floors (it is easier than in meters), at what height the bridge [viaducts] will pass close to the buildings?" In order to facilitate the comprehension of the EIS it is necessary to include clear representations of the information, such as visual aids.[20]

Non-technical summaries always include a map showing the location of the project as well as a drawing of the project. However, these drawings are not always effective in communicating where the project is going to be located. For example, in a public hearing in the Vasco da Gama Bridge EIA, one citizen said, "you [the representatives of the EIS team and the proponent] should have a map for the population ... From what I see I have the feeling the population is going to have a physical connection to [nearby town]."

Another important obstacle to public participation is the fact that the assumptions made in the development of the EIS are not explicitly stated. Usually, the study does not state clearly the area of impacts of the project, the time frame, the selection criteria of the variables and the weight of each variable. Also, EISs are not explicit about either the options taken by the EIS team in case of lack of information or the uncertainty of their analysis. The fact that these assumptions are not clearly stated brings lack of credibility to the analysis and to the EIA process itself. For example, in the Vasco da Gama Bridge EIA,

[20] Based on interviews with to members of environmental organizations that usually participate in EIA.

one environmentalist comment "The EIS suggest an average traffic volume of 30000 vehicles. However, this number is not referred to any methodology. It looks as if it had fallen from the sky."[21]

2.5 Major Findings

The major obstacles to public participation in EIA in Portugal arise from the characteristics of the EIA process. One of the most important obstacles is the fact that decisions are frequently made before an EIA has even started. Therefore, the EIA is used as a justification for a preconceived action. Moreover, in Portugal no scoping and screening phases are required. Thus, public participation is limited to reacting to the EIS. These two problems are the major complaints of environmental organizations who want to be involved from the beginning of the process and to influence the project definition effectively. According to one environmentalist, "When the discussion is at the execution project phase, it is too late to change anything. The discussion should be made earlier, at the planning phase or at the selection of alternatives." [22] The fact that most decisions are already made and the public gets involved in only later stages of the process gives a lack of credibility to the whole process. As one environmentalist said in the public hearing of the Vasco da Gama Bridge, "This EIS is a fraud. The decisions are already made."[23]

Nevertheless, public participation is still considered useful by both the administration and environmentalists. The administration considers that the public has important knowledge about the area and since they are the ones who are affected, they should have an opportunity to influence decisions. The environmentalists regard public participation as an opportunity to get to know the project better, to express their opinions and to apply political pressure to influence the decision. Participation of environmental organizations in EIA, has managed to change and has even stopped projects. One example is the case of the extension of Setúbal's harbor, where the comments made by national environmental organizations together with political lobbying and media coverage influenced the decision-maker to stop the project.

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21 Comment made by João Joanaz, member of GEOTA, during a public hearing for the Vasco da Gama Bridge held in Alcochete, September 1994, cited in the transcript of the public hearings accessible at IPAMB, Lisbon, October 1994.

22 Comment made by João Joanaz, member of GEOTA, in an interview held in Lisbon, January 1996.

23 Comment made by Francisco Moreira, member of LPN, during a public hearing for the Vasco da Gama Bridge held in Portela, September 1994, cited in the transcript of the public hearings accessible at IPAMB, Lisbon, October 1994.

However, the organization of the process as well as the presentation of the information, limit public participation. In terms of organization, the main problems are inefficient invitation to participate, limited access to the EIS and inefficient mechanisms to answer the public's questions. The presentation of information is technical, with few representational aids, and the assumptions made by the EIS team are not explicit.

The problems presented above lead to small numbers of participants in EIA (According to Gil, (1995), only approximately 1200 persons participated in 1994). Environmental organizations are still not a constant presence in EIA processes although they have managed to influence decisions in some cases. However, all these issues have improved since IPAMB started to manage the public participation process. One should note that IPAMB only recently (for less than 3 years) has become responsible for coordinating the process. A revision of the EIA laws is currently under preparation and it is expected to include public participation from earlier stages of the process. This would improve the effectiveness of public participation in EIA in Portugal.

CHAPTER 3. THE USE OF INFORMATION TECHNOLOGIES TO FACILITATE PUBLIC PARTICIPATION IN EIA IN PORTUGAL

3.1 Introduction

Public participation in EIA in Portugal takes place according to certain procedures established by law. These procedures establish the mechanisms for public participation (for example public hearings) and the information to be shared among the EIA stakeholders. Therefore, participation involves the understanding of large amounts of information by a public possessing various levels of knowledge. This information is generally complex and the variables presented are usually interrelated. For example, in the Vasco da Gama Bridge EIA one of the predicted negative impacts is the decrease of water quality due to the digging of estuarine sediments. If the sediments are contaminated, the estuarine ecosystem and the fishery activities will be damaged.

In order to engage the public in the EIA process, it is necessary to provide access to the pertinent information, allow communication among the stakeholders and present the information in a way that the general public understands it. In Portugal, the organization of these issues has led to some inefficiencies in the public participation process. Information technologies, such as the Internet, can be used to address some of these inefficiencies and facilitate public participation. The Internet allows more options to access EIA information, to communicate among stakeholders and to present information. The existence of more options would allow a wider range of stakeholders to participate in the EIA process.

Considering the requisites of the public participation in EIA, the World Wide Web (WWW) appears to be particularly suited to facilitating the process. The WWW is an information retrieval initiative based on the Internet aiming to give universal access to a large universe of documents (Berners-Lee, 1994). The information is structured in an associative manner. For example, a document about impacts on water quality of a specific project can be linked to other documents containing a list of water quality standards. This type of structure allows a non-sequential exploration of data.

This chapter explores the potential for using the Internet and more specifically the WWW in a public participation context. Since the Internet is still a recent technology, its potential to facilitate public participation in EIA has not been fully explored. However, other areas of application support the possibility of using the Internet to facilitate public

participation in EIA. Applications relevant for this work are found in the area of political activism using the Internet (Bonchek, 1995) and in the area of planning support systems (Shiffer 1995, Fonseca 1995 and Hughes 1994). For example, some planning support systems have explored the use of alternative ways to structure and present the information to improve communicability of diverse stakeholders.

The use of the technology has some drawbacks, mainly related to the access to the technology, familiarity with the technology, cost and willingness to implement such a system. In this chapter, I begin to analyze what functions information technologies can play in public participation. Then, I describe previous work done in this area. I identify the major obstacles to the use of information technologies in public participation in EIA, and I then conclude with a brief summary.

3.2 Functions of Information Technologies in Public Participation in EIA

Public participation in Portugal is constrained by organizational deficiencies and problems with the presentation of information. The main organizational problems are: poorly distributed invitations to participate, limited access to the EIS and inefficient answers to the public's questions. The information presented is technical and lacks representational aids. Moreover, the assumptions made by the EIS team are not explicit.

Information technologies could facilitate the resolution of these problems. They should allow the public to interact with the information presented and with the stakeholders involved in the process (that is, the public, administration involved in the evaluation process, decision makers, the EIS team, and the proponent). The public should be able to interact with the information presented, express its thoughts about the project and receive feedback.

The way that information is structured and presented affects how well the public understands environmental phenomena. Information technologies allow related pieces of information to be linked. Therefore, EIA information would be structured in an associative manner. Information technologies can use different types of media such as video, sound and text allowing for diversity in communication. For example, the noise impact of an airport could be described in terms of numbers or in terms of sounds. With recent developments in information technologies, the Internet and more specifically the WWW appear to be the most suitable for public participation because it allows a diversity of options to access information, to communicate and present the information.

3.2.1 Access to EIA Information

The use of the Internet to make EIA information accessible would diminish the time and place constraints that currently exist in public participation in Portugal. The EIS would be available to any computer connected to the Internet. The Internet allows users located in different places to access information with reduced time constraints. Another advantage of using the Internet is that it allows multiple users to access the same document simultaneously. Therefore, environmental organizations would not need to buy a copy of a study from the Institute for Environmental Promotion (IPAMB); it would be accessible online.

Access to the information in the Internet is facilitated by the existence of search mechanisms, such as Gopher. These search mechanisms allow the user to search documents and databases. These mechanisms usually use a hierarchical indexing of the information. The WWW, due to its information structure, uses different indexing mechanisms. The index mechanism used in the WWW follows established links. However, the searching mechanisms do not allow a comprehensive search (Shiffer, 1995). According to a WWW survey, 34.5% of the users identified as a problem the fact that they could not find a document that they knew was published in the WWW (GVU User Survey 1995).

Assuming that appropriate means of public access existed (for example in public libraries), the Internet would also give the public an easily accessible place to see a list of projects undergoing a public participation process. Because updating the information in the Internet is simple, the list of projects available could always be current. Using the Internet, the public could also make use of globally available resources. The public could invite experts from around the world to participate in a videoconference about specific topics.

In addition, the Internet allows fast and cheap transmission of large amounts of information. If EISs were available through the Internet they would reach the public in the same instant that they were put there. Nowadays, the public has to wait for a study to arrive by mail, which can take at least one to two days. The time factor is especially important when the information is only available for a short period. Moreover, according to Pool, et al. (1984) the transmission of each character by electronic means is cheaper than by telephone, written letter or facsimile.

3.2.2 Communication Among Stakeholders

Communication between EIA stakeholders can be improved by the use of the Internet, since it provides for several communication media. Media can be classified as synchronous and asynchronous. Synchronous media such as the telephone require the sender and receiver to communicate at the same time. Asynchronous media such as e-mail allow the receiver to get the message at any point after it was sent. Communication media can also be divided into one-to-one, one-to-many and many-to-many media. The one-to-one media connects one sending location with another receiving location. The one-to-many connects one sending location with multiple receiving locations. The many-to-many connects multiple sending locations with multiple receiving locations (Bonchek, 1995). Table 3.1 presents examples of different types of media available through the Internet.

Table 3.1 Examples of communication media provided by the Internet

	Asynchronous	**Synchronous**
One to one	e-mail	talks
One to many	mailing lists	online moderated interviews
Many to many	news groups, bulletin boards	chat-rooms, video-conferences

Another Internet characteristic that facilitates communication is the existence of filtering mechanisms that allow users to get only specific types of information. For example, a user can set up a filtering mechanisms based on the sender of e-mail messages or on the subject of that messages. The filtering mechanisms are very useful since they can prevent users from being overwhelmed with information, especially with information not relevant for them. However, filtering mechanisms can diminish the variety of information that one user is exposed to. For example, if one is only interested in the habits of the jet-set, one will probably not receive information about low income communities. Debates done using the Internet can be accessed mainly by people with the same interests and therefore fewer different perspectives will be discussed.

3.2.2.1 One-to-one Media

The use of the Internet can improve communication among the public. For example, e-mail, which is one of the most popular tools on the Internet, allows personal and interactive communication. Some environmental organizations in Portugal currently communicate within themselves using e-mail. In some situations, they prefer e-mail to the

telephone since it does not require simultaneous presence.[24] E-mail can also be used as a mechanism for sending public comments to the institution responsible for gathering the information. This can facilitate the compilation of public comments since the institution responsible for public participation will receive the information in digital format, which is easy to manipulate. The public can use e-mail to send its comments to institutions connected to the Internet, such as the press.

3.2.2.2 One-to-many Media

E-mail is a one-to-one mechanism; therefore, it has some limitations when a user wants to communicate to a larger group. In these cases, the use of mailing lists illustrates the advantages of one-to-many mechanisms. This is a very powerful tool for organizing activities. Groups of individuals can collaborate on proposals in spite of physical and temporal distance (Crowston, 1994). According to some members of environmental organizations in Portugal, mailing lists are especially useful in the production of comments on a specific EIS. To produce a comment is a collaborative effort that involves the revision of drafts of the comments by several members of an environmental organization.

Another example of a one-to-many mechanism is the online moderated interview. This synchronous mechanism could be useful for public participation since a debate could be initiated after an initial interview with an expert or a stakeholder. This mechanism is more directed to allow one interviewee to explain his positions and answer specific questions.

3.2.2.3 Many-to-many Media

Many-to-many communication allows the Internet users to initiate a debate about a certain issue. These debates can be carried using synchronous and asynchronous media. Examples of asynchronous media are bulletin-boards and newsgroups where a user can post a message that will be accessible to other users for their comments. The public can use these media to question the project and the EIS and get answers to their questions. Individuals can post "does anybody know?" questions that tap into the collective, informal wisdom of online communities (Sproull and Kiesler 1991). These media could also be useful to organizations in forming coalitions to support their positions relative to certain projects. Chat-rooms and videoconferences[25] require the simultaneous presence of all

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[24] Based on interviews with members of Portuguese environmental organizations, held in Lisbon, January 1996.

[25] At present videoconferences can be done using a desktop computer equipped with a video-camera; the need for sophisticated settings has decreased.

participants. They allow many users to meet virtually and to communicate among themselves. Many-to-many media could be used to create a dialogue among the different stakeholders with less effort than the organization, for example, of a public hearing. Public hearings would no longer be the only mechanism to answer public questions. The Internet could be also be a way to do that. However, the existence of Internet applications to support public participation does not imply that public hearings should be replaced.

3.2.3 Presentation of the Information

Information technologies can enhance the presentation of EIA information since they allow more flexible ways to organize it. For example, in an EIS one should be able to understand which variables were used to build a specific index. The use of an interactive application structured in an associative manner would facilitate access to that information, since it would allow for a non-sequential exploration of data. For example, if there is a reference about water quality the user can jump to a full description of water quality parameters, without having to go through all the other environmental descriptors such as air quality. For an index of water quality it could be possible to click and find the variables used to create that index, what they mean and how they were weighted to create the index. This type of associative structure is called hypermedia. Documents are structured as a graph where each node contains information (images, video, sound and text). In this hypermedia structure, nodes are connected by links that allow the users to move from one node to another (Nielsen, 1990). The WWW is one example of a system using hypermedia.

The use of images and sounds allow the creation of more descriptive representations of reality. For example, instead of a description of the location of a project, a map or an aerial photograph of the area make it easier to understand where the project is going to be located. Fonseca et al (1995) and Vinning et al (1989) have identified the use of video and images as a way to improve comprehension of environmental phenomena. This type of phenomena usually has strong sensorial effects, such as visual. Therefore, the use of images and videos can help to communicate those effects. The use of images, videos and sounds allow the presentation of certain information in a way that is easy to understand without having to rely exclusively on technical indexes. For example, instead of saying that the noise impact is very significant because it reaches x decibels, which could be acceptable for some and not acceptable for others, the decision-maker could have the opportunity of listening to what x decibels really sounds like (Shiffer, 1995).

The use of visual simulation models, such as 3-D representations of a bridge, can help the public to understand the impacts of a project in a landscape. Visual simulation models can enhance the representations of the reality. Simulation models such as the dispersion of water contaminants in an ecosystem are used within EIS to predict changes in the environment. However, traditionally these models present their results in the form of numbers and text making the comprehension of the results difficult. Simulation models using images can facilitate the communication of the results. Also, it would be interesting for the public to have the possibility to change the initial conditions and understand the impacts of the project. For example, the public would have the opportunity to see the dispersion of air pollutants in a specific area if the model considered a traffic volume of 1000 vehicles instead of the 30, 000 expected.

The use of information technologies to circulate EIA information would imply the creation of large databases. The WWW allows dynamic access to databases and return of information based on a query performed by the user. This is done by the use of Common Gateway Interface (CGI). These databases could become long-term sustainable sources of environmental information. It is important to note that at present there is little environmental information in Portugal because either it does not exist or is dispersed. However, the creation of such databases implies the structuring of information as well as its indexing.

The creation of databases with EIA information also has problems of data maintenance. However, the WWW model implies that information providers are responsible for the integrity and maintenance of the information they provide. The fact that diverse stakeholders are able to publish their information on the WWW can simplify the problem of data maintenance. However this model can bring problems in terms of integrity of the data.

Another advantage of the WWW is the fact that it is platform independent; in other words most WWW browsing tools operate across the major computer platforms such as UNIX, MS Windows and Macintosh. Therefore, users do not need to have a specific computer platform. They will access a single interface from any computer connected to the Internet.

Technology would not eliminate the need to make judgments and choose options on how to manipulate and present the data. Actually, it demands that people be aware of the

importance of judgment values. However, it can improve communication and help to make the information more interactive and accessible.

3.3 Previous Work

Computer networks enable people to communicate and share resources quickly and easily. They have become increasingly important in the urban planning process (Zinn, 1994). The widespread use of the Internet has allowed government agencies, non-governmental organizations and individuals to utilize computer networks as vehicle to improve communication and information dissemination (Bonchek, 1995 and Gabriel, 1993). Community networking is one example of such initiatives (Guthrie et al, 1990). For example, in St. Louis the City Planning Agency has established a community network with the goal of disseminating information to an impoverished community and increasing communication among members of that community and their elected officials. Access to the computer network is provided by the city in neighborhood community centers.

According to Bonchek (1995) computer-mediated communication facilitates collective action since it reduces group organization transaction costs. This reduction in transaction costs is mainly due to computer mediated communication characteristics such as speed, many-to-many communication and low costs. One example, presented by Bonchek, of groups and social movements that have used the Internet for their activities is the EcoNet (http://www.econet.apc.org). The EcoNet is a network that targets organizations involved in natural resource preservation and sustainable development. It enables members to send and receive electronic mail, participate and access online information services, distribute organizational information, and access the Internet.

The organizers of the United Nations Conference on Environment and Development (UNCED) have used EcoNet as an official network to carry UNCED-related information (Gabriel, 1993). The non-governmental organizations (NGOs) involved in the conference used mainly e-mail and online conferences although some NGOs used the network also to download information. However, the use of computer networks to facilitate an active participation of NGOs in the UNCED was not as successful as expected by its advocates. Many NGO members were not familiar with the technology and were overwhelmed by information, some of which was not even relevant for the UNCED (Gabriel, 1993). This example demonstrates two major obstacles for using information technologies to facilitate public participation: degree of familiarity with the technology and organization of the information.

However, computer networks can be designed and structured in order to overcome, at least partially, these two obstacles. One of the most popular examples is the WWW where the documents are linked together in a hypermedia structure. The hypermedia structure has the advantage of allowing a non-linear exploration of the information and of including images, video, and text (see Conklin 1987; Nielsen 1990 and Wiggins & Shiffer 1990). However, the advantages of using a hypermedia structure have only recently been brought to a network environment by the development of the WWW. Previously, hypermedia was only available in stand-alone systems.

The advantages of using stand-alone hypermedia systems in the planning arena has been discussed by Wiggins, Lang and Kindelberger. According to Wiggins hypermedia systems are suited to illustrating urban relationships, since they allow the integration of different types of information. The use of this type of system can support recollection of data, descriptions of the present and speculation about the future, important activities in collaborative planning settings (Shiffer, 1995). To support these activities, Shiffer proposes the use of representation aids, multiple representations of the same phenomena and the possibility of playing "what-if" scenarios.

Shiffer and a team at MIT developed a Collaborative Planning System (CPS) for an area of Washington DC to illustrate these ideas. The main assumption of Shiffer's work is that the consideration of a greater number of alternative scenarios will lead to a better informed public debate. The system uses maps, aerial photos, images, videos and sounds to make the user more familiar with the area and the proposed project. The user can fly over an aerial photo or an animation of a 3D model of the project. The user can choose a site to implement a proposed facility and visualize the resultant impacts; the system allows the user to superimpose a representation of the proposed facility onto a video clip of that specific area. The system aims to facilitate discussions in meetings about the impacts of a project through interaction with the information. The CPS explores the potential of a hypermedia system to facilitate a group discussion. However, CPS does not address some obstacles that public participation in EIA faces, such as access to information.

In the area of EIA, Fonseca et al. (1995) propose the use of a hypermedia system to improve features related to data storage, access to information, analysis capabilities and communicability of the results. According to Fonseca et al. (1995), the use of images, videos and sounds will enrich the analysis and communicability of the information produced in the EIA process. Although their work addresses the improvement of communicability of the EIA results as a way to improve public participation, the authors

were more focused on data analysis and information presentation than providing mechanisms to increase public participation. Thus, Fonseca et al.'s (1995) work does not explore issues like increased access to information and improved communication among stakeholders.

Hughes and Schirmer (1994) developed a hypermedia system with the intent to facilitate public participation in EIA. The authors assume that public participation will be enhanced by using a wider range of media, such as images and videos. The main objective of the system is to retrieve EIA information in an interactive way. However, this system has two main drawbacks: (1) It does not provide for communication mechanisms among stakeholders, which is an important feature in the public participation process. (2) It is not easy to update the information along the process. Therefore, it does not allow the system to capture the dynamics of the EIA process.

Shiffer (1995) and Fonseca (1995) identified the WWW as a way to overcome the difficulties of stand-alone hypermedia systems to update the information. In the environmental area, the WWW has been used mainly to retrieve information. One of the most comprehensive efforts made in this area is the Australian Environmental Resources Information Network (ERIN). The WWW documents (http://kaos.erin.gov.au:80/erin.html) allow access to information on the Australian environment held on databases and Geographical Information Systems (Boston, 1994). However, this site is an exception in terms of interactivity since it allows the use of models, production of maps and reports about localization of specific species.

In the area of EIA in Portugal, two WWW sites provide a list of projects under public participation. One of the sites is IPAMB's responsibility and is included in a broader project that intends to give information about public administration to citizens. The same information is available through the Internet and through 40 multimedia kiosks spread around the country. According to a leader of the project the Internet has the same number of users as, on average, one multimedia kiosk (around 2000 users since September 1995). The other site is provided by an environmental NGO that intends to disseminate information related to environmental issues to the general public. Although these efforts are valuable in terms of circulating EIA information they do not provide access to the EIS information.

3.4 Major Impediments for Using Information Technology

The use of information technologies to facilitate public participation in the EIA process is constrained by the public's access to and familiarity with the technology. The costs and the institutional willingness to implement an Internet based system to facilitate public participation are also impediments to using technology for this purpose.

Access to the technology is important since it determines who is able to participate in the EIA using the Internet. Access to the Internet does not only mean the establishment of a physical connection to the network. It also involves the difficulty of using that connection and the resources available through the connection. The connections should not be limited to a passive receipt of information; they should enable users to act as information sources as well as destinations (Keller, 1995). The access issue involves the consideration of two main questions: Who has access? and What are the barriers to access it?

In order to use the Internet, individuals and organizations must have computers, must know how to use them and must pay the network connection charges. Therefore, the users of the Internet do not represent the general population. Internet users are younger and more educated than the general population and are predominantly male and English speakers. More specifically, WWW users, who require a more sophisticated and expensive network connection, have a stronger gender, education, and income bias than the Internet users in general and are more likely to be students (GVU User Survey 1995).

In Portugal, although it is very difficult to get information about the number and characteristics of the Internet users, it is possible to assert that Internet users have a higher education and income level than the general population (Marques da Silva, 1995). They are fluent in English since most of the information available on the Internet is in English. The existing estimations of Internet users indicate a number of 70,000 users in Portugal (Marques da Silva, 1995). Although the number of Internet users is still relatively small, there is a growing trend, in concordance with the situation in the rest of the world. This trend is supported by the exponential increase of Internet domains[26] in Portugal. In 1991, there were only 11 Internet domains while in January of 1996 there were 245 domains (ftp file in /pub/portugal/dns/pt-domains.txt). The number and characteristics of the Internet users are especially important when considering the potential of the Internet to facilitate public participation.

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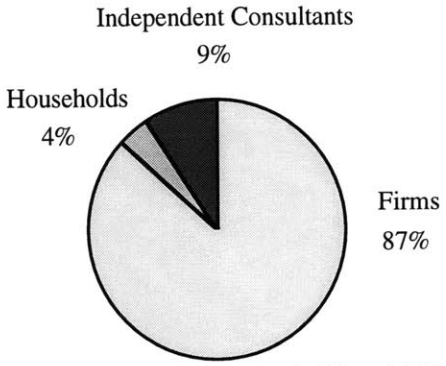
[26] The Internet domain describe organizations who have at least one host connected to the Internet. Therefore, the number of domains only give an indication of existing trends.

By looking at the distribution of computers, it is possible to estimate the percentage of Internet users who access it from home or from work. In Portugal, only 4 % of households have computers at home (Fig. 3.1). Of these households, only a small fraction is connected to the Internet. Therefore, it is legitimate to say that most Internet users have access to it through organizations. The list of Internet domains indicates the type of organizations that are connected. They include universities, banks, ministries including the Ministry for Environment and Natural Resources, radio and TV stations, newspapers, computer magazines and computer firms (ftp file in /pub/portugal/dns/pt-domains.txt).



Source: INSAT Consultoria e Serviços referred in Marques da Silva, 1995

Figure 3.1. Distribution of computers in Portugal

Some environmental organizations already have access to the WWW. Most of the environmental organization members access to the Internet at their work or in schools. At least two of the three national environmental organizations are planning in the short term to be connected to the Internet and publish information on the WWW.[27] IPAMB also plans to have a WWW server where it will provide information about the ongoing EIA process and how the public can participate.[28] The implementation of a WWW-based system should not be limited by the current users since the use of the Internet can change in the near future.

The potential barriers to access to the Internet include cost, speed and training. The cost to access the Internet includes the price of the hardware (a computer and a modem), the software and the cost of online connection time. Although the costs have been declining they are still too high for many households. For example, the cost of low end hardware, in Portugal, starts at $1,500 US. The cost of connection time depends on the type of connection, the user location and the service provider chosen. An average price of connection time, including access to the WWW and the necessary software, for an average

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[27] Geota, *Quercus* interviews held in Lisbon, January 1996.
[28] Helder Gil, coordinator of IPAMB's Division for Public Participation in EIA, interview held at IPAMB, Lisbon, January 1996 .

of 20 hours a month is $20 US. Because of the costs of phone calls, typically rural areas have higher costs than urban areas. Service providers allow the users to publish a homepage for an extra $100 US per month.

Another issue that limits the access to the Internet is the speed of accessing the information. This fact is especially important when talking about transmission of images and videos, as in the case of the WWW. In a Web users survey, speed was indicated as the main problem.

The necessity of training has declined since more friendly interfaces, such as the WWW, have become more common. The existence of the WWW made the distribution of information easier and it has a friendly interface. However, first time users still need technical training and assistance. The necessity of training also depends on the users familiarity with computers and their attitude towards technology.

The familiarity with technology influences the way users interact with the information presented. Information technologies can be intimidating for users without familiarity with the technology. This can limit the exploration and interaction with the information. Therefore, the ability to participate and make critical judgments by people who are not familiar with technology is limited.

Another issue that can limit the exploration of the system is the way information is structured. Hypermedia systems have been proposed as a way to structure the information in order to allow an exploration of the information more intuitively. The hypermedia structure allows users to explore the information in their own way, following an individual exploration path. However, users can easily become lost in hypermedia systems. The possibility of getting lost has declined as indicated by a WWW users survey (GVU User Survey 1995). Moreover, the wide spread use of multimedia kiosks and games as well as the WWW, suggests that people already familiar with computers are becoming accustomed to accessing information using a hypermedia structure.

Another issue is the fact that videos and images can create compelling representations of reality. However, the creation of these representations implies a value judgment by the people who produce them. Therefore, the use of images and videos also has the potential to create misrepresentations of reality. To be able to make a critical judgment, the public should be aware of the capabilities of the technology to manipulate the information as well as the value judgments involved in the creation of such representations of reality. Thus, the motivation of the institution responsible for implementing a system to

facilitate public participation will affect the credibility of information. For example, public reaction will differ if the proponents of the projects are responsible for implementing the system rather than if the responsible agents are environmental organizations.

In order to implement an environmental analysis system based in the WWW to facilitate public participation, two issues should also be considered: the costs and willingness to implement the technology. These issues involve the consideration of available financial and human resources. The implementation of such systems imply the cost of developing the system, which represents additional work since the existence of such a system would not replace the existing mechanisms to promote public participation. Therefore, the implementation of such a system will only happen if there is a willingness on the part of any of the stakeholders. The willingness to implement such a system depends on the interest to promote public participation and also on the number and characteristics of Internet users in the present and in the future. Although the existence of such a system will not allow the public to share responsibilities and authority in decision-making, it can help to create a critical mass of participants that would demand to have a more active role in the decision-making process.

3.5 Summary

The characteristics of the Internet allow the development of a system to facilitate public participation in the EIA. The Internet offers an important alternative for communication to geographically dispersed groups with a need for intra-organizational communication and information exchange. This characteristic allows stakeholders of EIA that usually never meet, except on the occasion of a public hearing, to communicate. Therefore, the public, the proponent and the administration of the EIA process can learn more about the project and the area.

The Internet and more specifically the WWW allow for alternative ways to present information. Information can be structured in an associative way that allows the linking of related pieces of information. In addition, the use of images, video and text presented in an interactive way provide for more descriptive representations of the environment. These interactive representations can help the public with various levels of knowledge to understand the project.

However, the usefulness of such a system is constrained by the real access of the public to the Internet and to the familiarity with the technology. It is also limited by the

willingness to implement such a system. Although the use of the Internet is not a reality for all segments of the population, its use is increasing. In addition, the use of the Internet could engage stakeholders, such as university professors and environmental organizations that currently do not participate frequently in the EIA process.

CHAPTER 4. STRATEGY OF INTERVENTION

4.1 Introduction

Information technologies such as the WWW can facilitate public participation in EIA in Portugal. Although the use of the technology would not break down major obstacles to public participation, such as the rationale of some stakeholders for supporting public participation, it can help to diminish some impediments, such as the access to EIA information. The WWW can be used only as a new medium to disseminate information or it can be used as a way to push public participation to have more influence in decision-making. The way the WWW is used depends on the motivations to support public participation of the institutions responsible for implementing such a system.

In order to address this problem three models of a WWW-based system to facilitate public participation in EIA can be developed: (1) the top-down dissemination model, (2) the "watch-dog" model and (3) the interactive project formulation model. The top-down-dissemination model intends to facilitate direct access to EIA information. The "watch-dog" model also intends to facilitate access to information but aims to allow diverse stakeholders to keep an eye on the action of public agencies during the EIA process. Diverse stakeholders will use the WWW to publish their opinion about a project. The interactive project formulation model aims to support project definition through the consideration of the different perspectives of each stakeholder. The consideration of the different perspective would result in the development of a collaborative EIS.

The implementation of a WWW-based system to facilitate public participation will differ according to the type of model adopted. Therefore, the adoption of a particular type of model is an important decision since it will determine the outcome of the system as well as the costs of implementing it.

In this chapter, I analyze the key issues involved in the design of a WWW-based system to support public participation. These issues include the definition of the goals of the system, the selection of information, the definition of the institutional setting responsible for implementing such a system and the definition of the structure of the information. Then, I describe the major obstacles of using a WWW-based system to facilitate public participation. I conclude with a brief summary of the proposed strategy.

4.2 Design of a WWW-based System

The design of a WWW-based system involves selecting and gathering information, structuring the information and defining a user interface. These activities, however, depend on the goals of such a system. The goals are defined by the key agents of the system: the developers of the system and the users. The developers of the system decide which information should be included and how it should be presented to the users. They select the information, structure it, design an interface and choose the technology to implement such a system. The developers' motivation for implementing the system will affect their choices. They can set up certain objectives, but it is the reaction of the users that will determine the relative success of the system. Therefore, the most important task is to engage the target users. The users will only use the system if it addresses their needs. Therefore, the design of a system has to consider the users' needs and their capability to use the system.

In addition, the technology chosen constrains the design of the system. In this case, since the proposed system is based on the Internet, it will benefit from the large distribution of the Internet, communication mechanisms such as e-mail, and the possibility of exchanging large amounts of different types of information, such as text and images. The Internet also enables the users of the system to publish their own information. However, the design of the system and definition of its goals will be constrained by the relative usability of Internet authoring tools.

4.2.1 Goals of a WWW-based System

The goals of a WWW-based system to facilitate public participation are determined by the organizations responsible for implementing such a system. The WWW can be used only as a new medium to disseminate the same information that the Institute for Environmental Promotion (IPAMB) currently sends to local governments and mass media. Or it can be used as a way to improve the EIA process by allowing to present multiple perspectives of the same project. The choice between these two alternatives depends on the rationale for supporting public participation of the institutions responsible for implementing the system. Therefore, the institutional setting responsible for implementing such a system determines the goals of the system, since different institutions have different agendas. It is possible to consider three models for a WWW-based system to facilitate public participation:

- **The top-down dissemination model** (Fig 4.1), where a public agency, such as IPAMB, uses the WWW as a medium to disseminate EIA information. Considering the way EIA is organized in Portugal, the top-down dissemination model would be used in the latest stages of the EIA process, that is after the EIS is completed. The main goal of this model is to facilitate access to EIA information, more specifically to the EIS. The users of this system would include environmental organizations, university professors and students, and public in general. One of the main goals of this model is to reach a broader public.

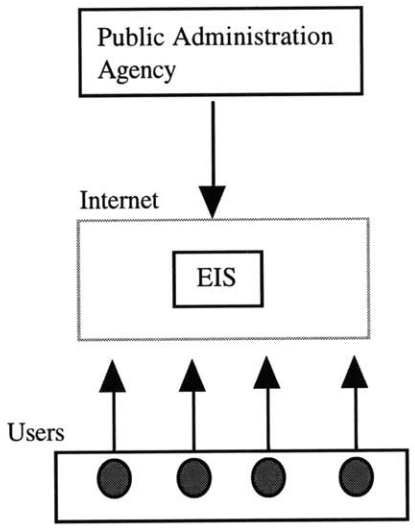

Figure 4.1 Structure of the top-down dissemination model

- **The "watch-dog" model** (Fig. 4.2), where diverse stakeholders, such as environmental organizations, are paying close attention to the way public agencies deal with a specific EIA. In the "watch-dog" model a public agency, such as IPAMB, publishes the EIA information on the WWW and diverse stakeholders also use the WWW to publish their critiques and comments on that information. The WWW is still used only as a way to disseminate information. This type of model is also designed to be implemented in the latest stages of the EIA process. The main goal of this model is to facilitate access to information, but in this case the information includes different opinions on the project. This model intends to promote a public debate based on the positions of different interest groups.

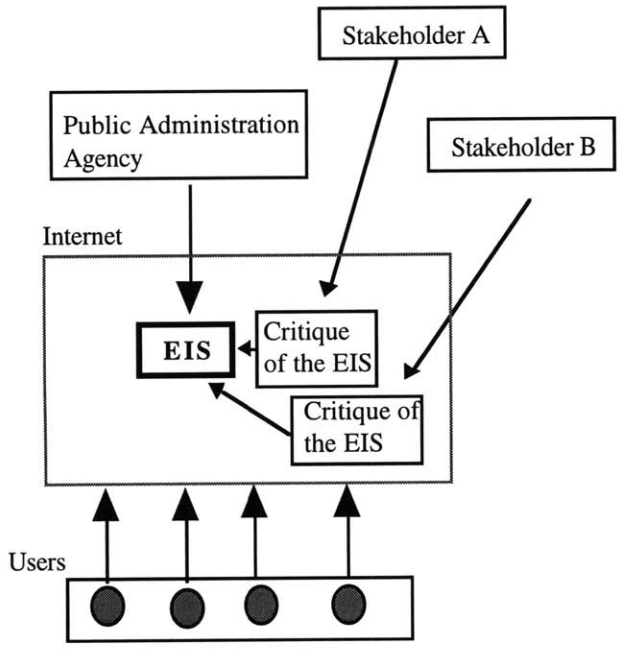

Figure 4.2 Structure of the watch-dog model

- **The interactive project formulation model** (Fig. 4.3), where the WWW is used as a vehicle for the different stakeholders, such as environmental organizations, the proponent, and the decision-maker, to express their views and interests about a project. The presentation of different perspectives would help the stakeholders to understand the interests involved and this would also help them to understand the possible tradeoffs. The adoption of this model would allow the development of a collaborative EIS where the different perspectives of the stakeholders are incorporated. This type of model has to be implemented in the early stages of the process. The perspectives of the stakeholders could be used as a source of information in the project definition stage. This would push public participation to higher levels of participation, since the public could influence project definition. The users of such system would be the stakeholders and their constituencies as well as the interested citizen.

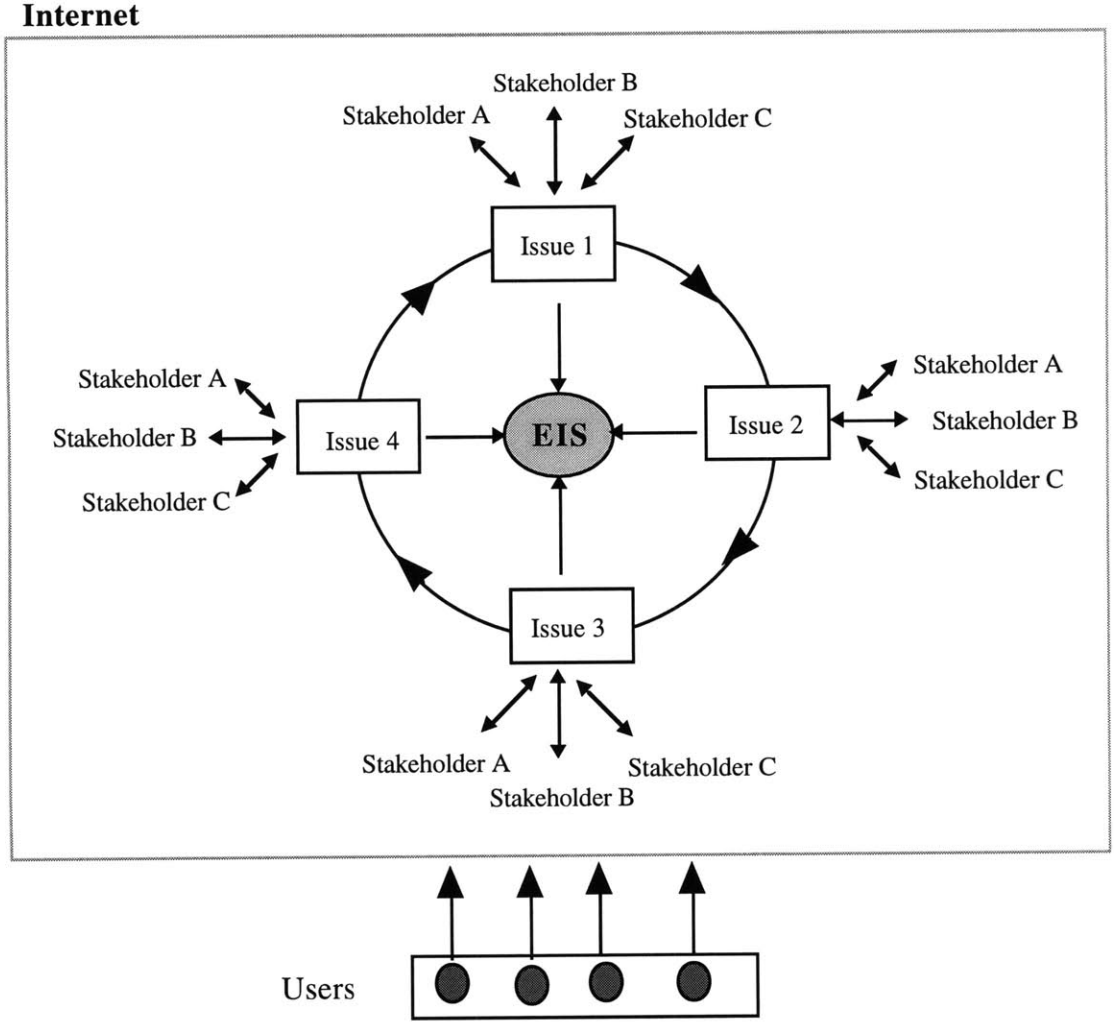

Figure 4.3 Structure of the interactive project formulation model

Public participation in EIA should not be restricted to an elite group. However, the scope of the WWW-based system to facilitate public participation is limited by the users of the Internet. Although it is not possible to know the future of the Internet in Portugal, at present the Internet users still belong to restricted categories. They are middle class, well educated and they usually access the Internet through their university or work. However, it is important to note the fast rate of growth of the Internet in the last couple of years and not limit the goals of a WWW-based system to the current users of the Internet. The development of the WWW system can be designed according to different possible scenarios of Internet users.

This system could first target mainly non-government organizations such as environmental and professional organizations, as well as universities, since the majority of these institutions already have access to the Internet. In addition, these organizations have

a strong effect on the EIA process, since they are organized, have technical knowledge and usually have enough political power to affect decisions. The engagement of these institutions can help to increase public motivation to participate in public processes. As the number of Internet users grows, the system should target other groups such as, the ordinary citizen; this implies more careful considerations of the interface of the system

4.2.2 Information to Be Included in the System

The information to be included in the system depends on the model of WWW-based system. Presently, the way public participation is organized leads to the top-down dissemination model. In this type of model the EIS, particularly the non-technical summary, is the information used to support public participation in EIA. In accordance with the law, the non-technical summary is the document used to inform the public. In addition, the complete EIS is also made available to the public for comment. Thus, the WWW-based system to facilitate public participation should allow access to the EIS.

The technical report of the EIS is frequently used as a source of information by public's comments.[29] The EIS is used more by organizations with technically literate members, such as the national environmental organizations; local environmental organizations usually limit their analysis to the non-technical summary. Therefore, a WWW-based system should allow include both technical reports and non-technical summaries, to enable users with various levels of knowledge to take full advantage of the system.

The non-technical summary includes maps showing the location of a project and a drawing of it. These items should be included in the system. In order to improve the understanding of the information presented, the WWW-based system should also include easy-to-understand representations of the project. For example, it should include aerial photographs of the area of the project since aerial photographs transmit information in a way that is more easily understood by the non-technical public. Photos and/or videos of the most important landmarks of the area should be included. The inclusion of these types of information is especially important in areas such as the visual impact on the landscape.

Other information that is relevant and should also be included in the system is procedural information, such as the period when the study is available, how it is possible to

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[29] Based on interviews with members of environmental organizations and from the analysis of the public participation process of the Vasco da Gama Bridge

participate and who IPAMB invited to participate. The system should include information about who is involved in the EIA, for example the developer, the EIS team and the technical commission and how to contact them.

In addition, the system should also include information about the outcomes of the decision. This last aspect is important since it allows the users to check how the public's opinions were taken into account and the rationale for making a specific decision. However, the inclusion of this information can be particularly difficult to implement since at present it is not collected and organized. In a study done by Raposo (1995) it was not possible to know the reasons behind the decisions for the majority of the projects analyzed.

The inclusion of the EIS related information and procedural information is important since it is the basic information in EIA. However, if the system only includes this information, the WWW will be only a new medium for transmitting the same information. The inclusion of this type of information alone would correspond to the implementation of the top-down dissemination model.

The implementation of the "watch-dog" model is based on the fact that the WWW allows different stakeholders to publish their opinions about the EISs. The different stakeholders could use the WWW to question the assumptions made in the EIS and to discuss any points of controversy. As stated in chapter 2, which discusses public participation and EIA, one of the factors that creates misunderstandings in the EIA process is that EISs contain value judgments. The value judgments made by the EIS team are generally hidden and are a source of discussion and disagreement during the public participation process. Therefore, one way to engage the public could be to question the assumptions of the study. The EIS could be analyzed by different stakeholders in issues such as who are the stakeholders of the process? What is the geographical area considered in the study? What is the time frame considered in the EIS? What were the variables selected? What were the data used in the development of the EIS? What were the attitudes of the EIS team concerning the uncertainty of the data? How were the variables weighted? In the amalgamation of the data, did the EIS team use incorrect operations, such as adding numeral and ordinal data? What were the proposed mitigation measures? The inclusion of such a critical analysis done by different interest groups would help to trigger a public discussion.

The existence of this type of analysis would also increase the quality of the studies. EIS teams would be more careful in the way they made assumptions if they knew their

work was going to be analyzed and criticized and that critique was going to be published on the WWW. However, this approach would only emphasize a reaction to the study and to the project. It would not be helpful to the decision-maker and to the public in general to understand the tradeoffs involved and the interests of different stakeholders. It would not enable public participation to have more influence on project definition. This model of a WWW-based system would mainly create incentives for the public to pursue litigation.

In order to overcome these problems, it would be necessary to follow the interactive project formulation model. The fact that the WWW allows the simultaneous presentation of different perspectives allows public participation to go further in the EIA process: instead of reacting to the study, the different stakeholders could present their perspective about important aspects of the project. The presentation of different perspectives should be done in early stages of the process. This would allow the consideration of the stakeholder's perspectives in the formulation of the project as well as in the formulation of the final EIS. This could also facilitate the understanding of what is at stake in a specific project. If the stakeholders present their view the consideration of the public's and other interest groups' indigenous knowledge would be introduced into the decision-making process. This type of approach would facilitate a consensus to be reached and it would help the stakeholders to negotiate agreements that better serve their interests.

The perspectives presented by the different stakeholders should include their perspectives in the five components of every EIS: location of the project, description of the project, description of the environmental characteristics of the area, assessment of the impacts of the project and mitigation measures. In order to clarify the assumptions included in the perspectives, the institution responsible to implement such a system would provide a set of guidelines to help the stakeholders to structure their perspective. The use of representational aids such as videos of the area and visual simulations should be included in the system in order to facilitate the understanding of the information.

4.2.3 Structure of the System Information Gathering

The institutions responsible for implementing a WWW-based system have a crucial role in the definition and achievement of the goals of such a system. Various stakeholders in the EIA have different motivations to support public participation. The motivation of the public administration to support public participation is basically to increase the perception of legitimacy of decisions. Although some members of the public administration believe that the public has indigenous knowledge that should be considered in the decision-making

process, they are not in a position to push public participation so that the public has a higher influence in decision-making. Thus, if the institution responsible for setting up such a system belongs to the public administration, as it is in the case of IPAMB, a WWW-based system will be thought of only as new medium to disseminate information. The role of IPAMB as a coordinator of public participation in EIA, does not allow IPAMB to take sides publicly about the study. IPAMB can ask the EIS team to change the non-technical summary for example, to eliminate some technical language, but from the moment the non-technical summary is available to the public IPAMB is not in a position to criticize the study. In order to have its role of coordinator of public participation accepted by all stakeholders IPAMB can not show interest in the outcome of the process.

IPAMB is willing to use the Internet as a way to improve the dissemination of information and facilitate the access to that information, that is, to follow the top-down dissemination model. Based on the characteristics of the participants in EIA, members of IPAMB think that the use of the Internet to publish EIA information could help to engage university professors who could have important knowledge to contribute in the EIA process but currently do not participate. Therefore, IPAMB aims to publish on the WWW a list of the projects subject to a public participation together with a brief explanation of how to participate in the process. IPAMB also intends to publish a WWW version of the non-technical summaries.

The use of the Internet would facilitate access to the EIS. Access to the EIS is considered an impediment to public participation by the environmentalists interviewed. This improvement in access to the EIS would not imply a significant increase of cost to the institution responsible for coordinating the public participation process. Currently all EIA teams use word processors to type their reports. Therefore, it would not be difficult to get a digital copy of the study and make it available on the Internet. However, to get a digital copy of maps and drawings of the project could become more problematic since the use of mapping and graphic software is not as common. Low cost solutions, such as scanning the maps and drawings, could be used to make that information available on the Web. Therefore, any Internet user could get a copy of the EIS at his/her convenience.

The role of pushing public participation to have higher influence in decision making has been taken by other organizations such as environmental organizations and professional organizations. Considering the way public participation is organized, participation has been mainly reactive and has originated some conflicts. Therefore, organizations such as environmental organizations could use the WWW to present their criticisms to the EIS,

which means implementing a "watch-dog" model. The presentation of a critique about the EIS would provide more information for the public debate. The publication of a criticism about the EIS and the project would be the responsibility of each stakeholder. Therefore, it would be dependent on the willingness and know-how of each stakeholder to publish that information on the WWW.

However, to go even further in the process of pushing public participation to influence decision-making, the model of interactive project formulation should be followed. To implement such a system, the following aspects have to be considered: which institution is responsible for setting up and manage such a system? How should the stakeholders be made to present their perspective? And how is it ensured that the stakeholders' perspective is taken into consideration in the project formulation? The institution responsible for setting up such a system influences its credibility. Therefore, it should be a party with no vested interest in the project. However, a non-interested party is not necessarily a party without an agenda. The agenda of such an institution should be to allow for a fair representation of all stakeholders.

A non-governmental organization (NGO) could be created in order to set up and manage such a system. This organization should include people who want public participation to have more influence in the decision-making process. In order to increase the credibility of the system, this organization should avoid the connection with potential stakeholders of the EIA process at the institutional level. For example, it could accept members of environmental organizations but only at the individual level and not as a representative of the environmental organizations.[30]

The tasks of such an organization include identifying the stakeholders of a specific project and identifying, among these stakeholders, representatives who could develop the stakeholders' perspective on the project. The NGO should provide a framework for presenting the information. This framework should be structured as a set of questions about the most critical aspects of the EIA. Other tasks of such an organization include giving technical support to the stakeholders to produce their own homepages and manage a web server. As a result, the NGO has to include people skilled in conflict assessment, computer systems, and computer systems management.

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[30] Recently in Portugal, an organization with this characteristics has been formed. The organization, Observatório do Ambiente, intends to promote an arena of debate on environmental issues. This group is created by a diverse group made up of people in the environmental area such as journalists, elected officials, members of environmental organizations and professional organizations. This organization has already set up a site on the Internet that provides a list of projects currently under public participation. This organization seems to be perfect for this task. However, I do not know about their willingness to take that job.

However, the implementation of this type of system would not be an easy task. This type of system requires a change in the way the EIA process is organized. Therefore, all the stakeholders have to believe in the benefits of such a system. One of the roles of the NGO could be to educate the public and decision-makers of the benefits of pursuing its development. The NGO could start with an illustrative example, a case study, that was agreed upon by the developers, decision makers, and other stakeholders to make a case study. One way to implement such a system could be through the creation of incentives to promote a project formulation where the public participates. This last option would imply that the ministry shared the same rationale for supporting public participation. However, this implies a change in the rationale to support public participation from the different participants in EIA.

In order to increase the use of any model of a WWW-based system to facilitate public participation, the institutions responsible should implement some training for potential users such as environmental and local organizations, members of public administration and members of EIS teams. The curricula should include training in how to access the Internet, how to establish an Internet connection, how to browse through the main components of the system and how to publish information on the WWW. Public debate would only be enhanced if more stakeholders are allowed to publish their views about the project. This would allow organizations to publish their own information about each project.

4.2.4 Structure of the Information

The information of a WWW-based system to facilitate public participation can be structured in a way that is applicable to every EIA. The structure of the information should be flexible to allow adaptations to every case. The information can be divided into two main components: (1) EIA procedural information, and (2) EIS information. This structure of information would be applicable to any models of WWW-based systems.

The system should begin with a list of projects currently subject to public participation, since users will want either to know which projects are currently subject to public participation or search for a specific project. If the user starts from the EIA information, the initial page should include a list of projects currently subject to public participation and a list of projects that are no longer subject to a public participation process. The inclusion of this last list would allow access to the decisions and the

reasoning behind these projects. From these lists it would be possible to access more detailed information about each specific project.

The WWW-based system should take advantage of characteristics of the technology that could improve public participation, such as the possibility to communicate using asynchronous mechanisms. Users should have the opportunity to subscribe to a mailing list. They would get information about the projects subject to public participation and the events scheduled for each project, such as public hearings, in their mail box. This would allow users to be informed without needing to consult the homepage.

The more detailed information should include administrative information such as: when is it possible to participate? Who are the stakeholders in the process? And how is it possible to contact them? It should give access to a very brief description of the project and its generic location to allow users to filter the projects they want to get more information on.[31]

If the users decide to get more information about a project, they can get access to a Web version of the EIS. Although the structure of the EIS varies from study to study, the WWW version of the study can be structured according to the five main components, that are part of any EIS:

- Location of the project. This defines the area of the project and establishes the boundaries of the impacted area. This includes at least one map showing the location of the project and the area of impact.

- Description and justification of the project. This includes a description of the project and the reasons to build such a project. This usually includes a map or a drawing of the project.

- Environmental characteristics of the area. In this component of the study environmental variables are selected and described. The selection of the variables is a subjective process that must rate the relative importance of these variables in the area.

- Impacts of the project. This describes the impacts of the project for a pre-selected set of different variables. It is in this section that models are used to predict and measure probable impacts of the project. Impacts are amalgamated and ranked according to

[31] IPAMB already includes this brief description in a leaflet that is distributed to the public. This leaflet also has information about how it is possible to participate in the EIA.

criteria defined by the EIS team. Sometimes, this section includes a matrix of impacts, usually organized by activity of the project and its impact on each environmental variable.

- Mitigation measures. This describes measures proposed in the study to mitigate negative impacts of specific actions.

Every page should allow access to a page of comments. This page of comments would include the option of sending comments to IPAMB, and if the users wanted, their comments could be published in the comments page and be accessible to other users. The comments page would become a forum of discussion among the users of the system. The page of comments could be designed in order to facilitate the compilation of the comments made by the public.

The above described general structure can be applicable to any model of a WWW-based system to facilitate public participation. However, it is possible to define more detailed structures of information for each of the three models of WWW-based system: top-down dissemination, "watch-dog" and the interactive project formulation model.

4.2.4.1 Top-down Dissemination Model

The development of a top-down dissemination model would be the responsibility of a government agency such as IPAMB. This type of model is implemented in the later stages of the EIA process, when the EIS is already finished. The structure of such a system is described in Figure 4.1.

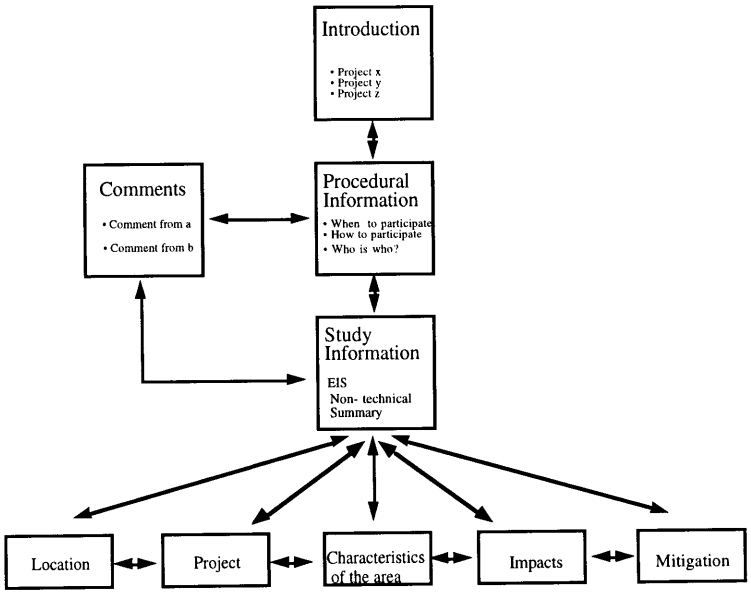

Figure 4.4. WWW structure of the top-down dissemination model

The introduction to the system will be done through a list of projects, from where the user can select one. It will then give access to EIA procedural information, which includes information about when and how to participate. In the information about the study, the whole EIS will be available by ftp,[32] but the system's principal document is a WWW version of the non-technical summary. The non-technical summary will be structured by its table of contents and will usually have the following structure: (1) Location of the project, (2) Project description and justification, (3) Environmental characteristics of the area, (4) Impacts and (5) Mitigation measures. IPAMB's role is to publish the information produced by the EIS team. The development of a WWW version of the non-technical summary only implies the transformation of the text of the non-technical summary into Hypertext Markup Language (HTML) format. There is software that automatically converts text into HTML, respecting the format.

4.2.4.2 "Watch-dog" Model

The structure of the "watch-dog" model is very similar to the top-down dissemination model. The "watch-dog" model assumes the publication on the WWW of the information produced by the EIA, that is the EIS. The publication of this information would be the responsibility of a public agency such as IPAMB. In addition, the "watch-dog" model includes the publication of the comments and criticisms of different stakeholders, such as environmental organizations, on the WWW. This type of model would only be implemented in the later stages of the EIA process. The structure of the "watch-dog" model is described in Figure 4.2.

In the watch-dog model there are two main components: the information presented by the public agency and the critique presented by each stakeholder that is willing to use the WWW to publish their opinions. Since the critiques and comments are the responsibility of their producers, the structure adopted is defined by each stakeholder. However, to clarify the main assumptions made in the EIS, the critique should follow the structure proposed in the top-down dissemination model. The stakeholders' critique could provide linkages to the pages published by IPAMB, such as the administrative information, the EIS ftp site, the list of scheduled events, and a link to the list of the stakeholders identified by IPAMB.

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[32] File transfer protocol. A standard protocol supported by the Internet to allow the transfer of files through the network.

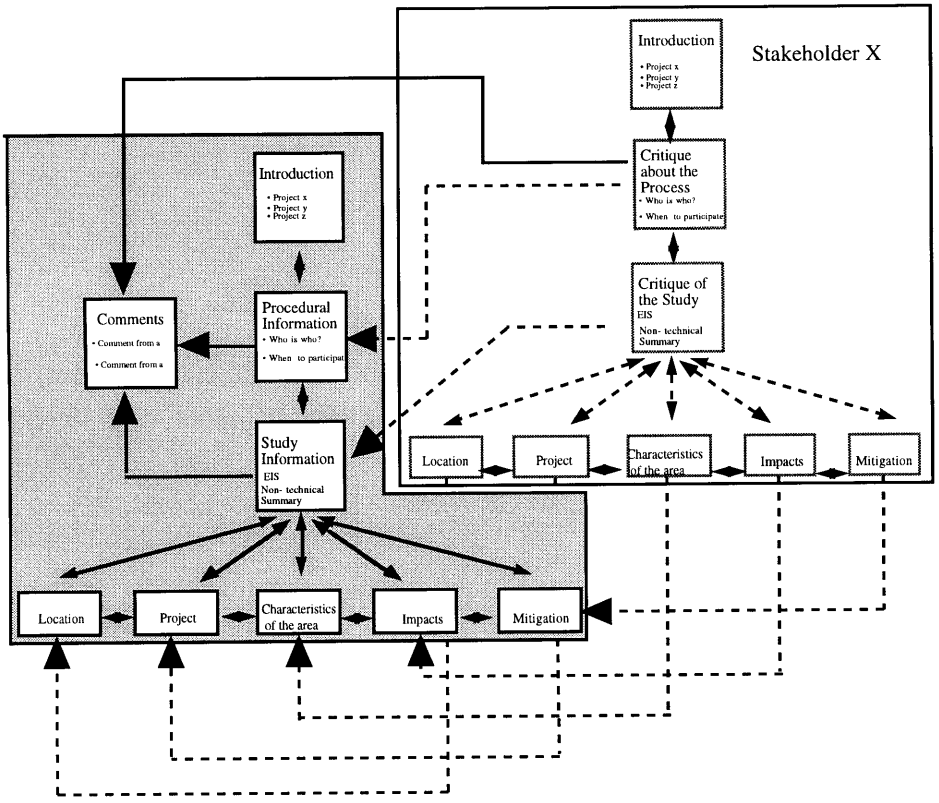

Figure 4.5. WWW structure of the "watch-dog" model

The introduction to the critique presented by each stakeholder should begin by a list of projects evaluated by that specific stakeholder. From that list it would be possible to access a critique about the EIA process conducted by the public agency. In that critique the stakeholders should evaluate who the stakeholders are in that specific project, and whether they are invited to participate by the announcements set up by IPAMB. The stakeholders should also provide a critique about the study. Even though the information presented by each stakeholder could be different, the structure of the critiques can be divided in five parts:

- **Location of the project.** The critique page would state clearly the area defined in the study. It could also state the stakeholder's opinion regarding the boundaries of the impacted area. If they were different, a map should show the differences. This page would include maps showing the location of the project as well as aerial photographs. From the aerial photograph, it would be possible to click on specific sites and see pictures and/or videos of the area.

- **Project description and justification**. This should include a map or drawing of the project showing it as it would be when implemented on the site. Preferably,

it should show a 3-D model of the project. It should analyze the project in relation to existing plans. It should also list the alternatives considered and how they differ from each other. In order to facilitate the understanding of the stakeholders, it should describe important features of the project in more easy-to-understand ways. For example, when talking about a bridge, the height of the bridge should be described in terms of floors instead of meters.

- **Environmental characteristics of the area.** The stakeholders should start by listing which variables were studied. They should also indicate whether any important variables were left out, and why each variable is important. At this point, the page should also allow users to express their opinion about the importance of the variables. For each variable, the stakeholder should identify the sources of information that were used by the study. Whenever possible, the critical perspective should provide multiple representations of the same phenomena. For example, photographs should be used to show any important wildlife species in the area. However, considering the work required to get this information, this inclusion should be left up to the stakeholder.

- **Impacts of the project.** This section should include a list of the variables used in the EIS. The stakeholders should state their opinion about the way the EIS team calculated or estimated these variables. This section should analyze whether the amalgamation done in the study used incorrect operations, such as the addition of ordinal and numeral data. It should identify the models used in the study to predict impacts and the uncertainty of the results. It should evaluate the weights given by the EIS team to each variable.

- **Mitigation**. The stakeholders should list mitigation measures that were considered for the most important impacts. It should also indicate the remaining impacts for each variable after the mitigation measures are proposed.

Each page developed by the stakeholder should allow the user to connect to the IPAMB comments page in order to send their comments directly to IPAMB and also to see the other users' comments. At the same time, the IPAMB comment pages should provide a connection to the page produced by each stakeholder criticizing the study and the project.

4.2.4.3 Interactive Project Formulation Model

In the interactive project formulation model, the information included in the WWW-based system is the perspective of each stakeholder on important aspect of the project and

its impacts. These perspectives should be used as a source of information for project definition and formulation of a collaborative EIS. Therefore, the implementation of this model should start at earlier stages of the process, when the developer has only a rough definition of the project. Each stakeholder would be invited to present their perspective on the project and study, and this perspective would be considered in the definition of the project.

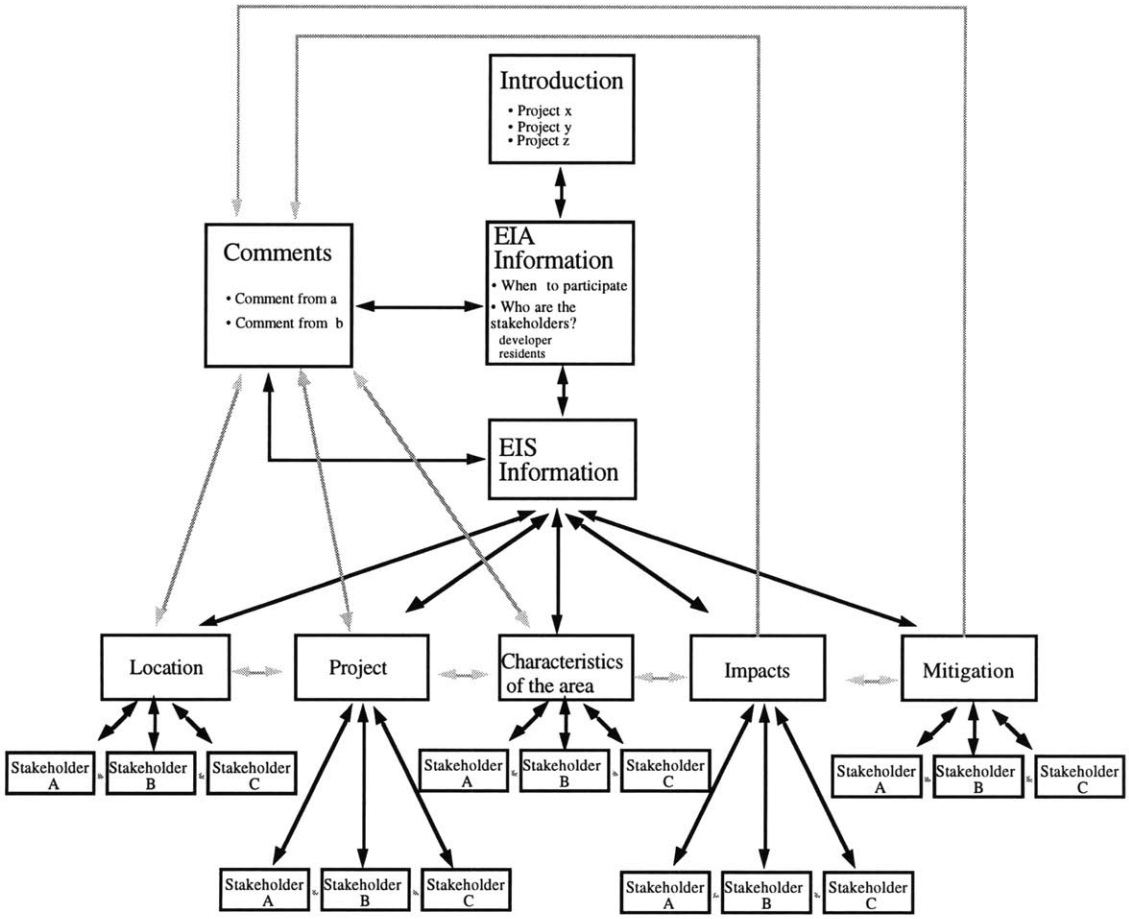

Figure 4.6. WWW structure of the interactive project formulation model

The WWW structure of the interactive project formulation model is described in Figure 4.3. The introduction to the WWW-based system should include a list of projects undergoing public participation. From that list it could be possible to access to EIA information that includes procedural information. In that page the NGO would provide access to a rough description of the project. This would include a map showing the proposed location of the project. In the same page, there would be a list of the identified stakeholders. This page would also allow users to use the system to identify possible stakeholders. In this type of model, identifying the stakeholders is very important and

usually difficult. Therefore it would be helpful to have the users of the system to indicate possible stakeholders. The EIS information gives access to the different perspective of each stakeholder about the five main components of every EIA.

This page would be linked to a more detailed information page about the project. The NGO responsible for implementing the system would invite each stakeholder to present their perspective about the project and impacts. The NGO should ask a set of questions about important aspects of the project. These questions should provide stakeholders with guidelines for structuring the perspective that is going to be published on the WWW. These questions should also be accessible to the users of the system.

Therefore, in each section about the project the user would access the questions made by the NGO to each stakeholder as well as access the stakeholders' perspectives. From the page of each stakeholder it should be the possible to access others stakeholders' perspectives. Users should also be able to send their comments to the stakeholders, to the NGO as well as to an electronic forum. This system is structured in five main components:

- **Location.** The NGO could present a generic map with the location of the proposed project. The questions in this section are:
  - What is the location of the project?
  - What are the boundaries of the impacted area?

In each stakeholders' page, a map and aerial photos with the delimitation of the project and its impacted area should be included. The stakeholders should be encouraged by the NGO to be as specific as possible about the determination of the boundaries of the impacts, for example they can distinguish the boundaries of direct impacts from the boundaries of indirect impacts.

- **Project description and justification.** The NGO could provide a description of the project as provided by the developer. The NGO should ask the following questions:
  - What is the purpose of this project?
  - What are your interests in the project?
  - What are your concerns about the project?
  - What are the viable alternatives to this project? (consider technological and design alternatives as well as location alternatives)
  - What is the relationship of this project to other planned activities?

The NGO should ask the different stakeholders to present their own visions of the project. In that vision, drawings and 3-D models should be encouraged.

- **Characteristics of the area.** The NGO should ask all stakeholders to describe the area defined in the location section. The questions are:
  - What are the more relevant environmental and social characteristics of the area?
  - What are the sources of information you used?

The NGO should encourage the inclusion of images, videos and sounds to illustrate the more relevant features of the area.

- **Impacts** The NGO would ask the stakeholders to identify the impacts of the project and rank each impact by its importance. The questions are the following:
  - What are the most troublesome impacts you think the project has?
  - Which important features of the area should be preserved?
  - In what time frame should the impacts of the project be considered?
  - If no project is to be built in the area, what is going to change in the area anyway? How?
  - What are the indicators that best show the impacts of the study?
  - How would you calculate and estimate them? (If you use models, please specify.)
  - How is each indicator going to be affected?
  - If you change your importance criteria, how are the indicators going to change? Over what time period?

In this section of the system especial attention should be given to present an sensitivity analysis. The NGO should encourage the stakeholders to present a sensitivity analysis, that is the stakeholders who want to present a matrix with the impacts of different alternatives should also present at least one more matrix where the variables have different weights to understand what is the effect of changing the weights of the variables. The NGO should encourage the use of multimedia simulations to present the expected impacts.

- **Mitigation** The NGO would ask the stakeholders to be as specific as possible in the identification of the mitigation measures.
  - What mitigation measures do you propose?
  - What are the expected impacts of the project after the mitigation measures are applied?

The NGO should encourage the stakeholders to present maps or drawings of the mitigation measures in order to clarify the location and purpose of the mitigation measure.

4.3 Barriers to a WWW-based System

The impediments to implementing a WWW-based system are mainly limited by the rationale of the institutions responsible for setting up such a system to support public participation in EIA. The motivations of these institutions also determine which model of the WWW system is adopted. The top-down dissemination and the "watch-dog" models face fewer barriers than the interactive formulation model. The implementation of this last model implies a change in the existing motivations of the public administration, the elected officials, developers, and the general public. The main impediments to setting up the first two models are funds and skills required to implement such a system. To set up such a system implies the design of the homepages and the loading of information for each project. The cost of implementing such a system would be different for each model and also for the different institutions involved.

In the top-down dissemination model, IPAMB can either rent some space to publish the information or set up its own server. Renting space would make the maintenance of the system easier for IPAMB and the costs would depend on the quantity of information that IPAMB published on the WWW. Considering the proposed structure, this could be approximately $625 US per month.[33] However, if IPAMB considered the implementation of a WWW system as a long term objective, it would be advantageous for IPAMB to set up its own WWW server. The costs of setting up a server would be approximately $8,000 US which would include buying a reasonable computer and a router in order to become an Internet server. The design of the system would require the initial design of the homepages. This could cost initially around $5,000 to $10,0000 US. To load the structure of the systems for each project would be cheaper, and considering that IPAMB would receive the information already in digital format, the development of the WWW pages for each project would take 5 to 10 hours of work, which, at market prices, would cost between $80 to $160 US per project.

The implementation of the "watch-dog" model would cost the same to IPAMB. In addition, the diverse stakeholders would have to support the costs of developing an

[33] This estimation considers that IPAMB will make available the EIS and a WWW version of the non-technical summary. Each project will occupy at least 5 Mb. Considering an average of 15 projects. IPAMB would need on average 75 Mb of space. This would cost approximately $625 US per month.

analysis of the study, of gathering information such as images and videos, and to publish this information on the WWW. These activities require specialized labor and are time consuming. The amount of hours necessary to perform the analysis and to gather the information is difficult to estimate since it would depend on the characteristics and scale of each project. However, based on interviews with environmentalists, these activities, including the loading of the system, would take, on average, 10 full working days. However, not every stakeholder would publish a critique for every study. Therefore, the cost of the stakeholders would vary and would depend on the amount and extent of the critiques they did. Nevertheless, the stakeholders have to also consider the cost involved in publishing their critiques on the WWW, which would be similar to IPAMB's cost.

The difficulties of implementing the interactive project formulation model are mainly due to the required change in rationale of most stakeholders about the EIA process. This type of model implies the participation of the public in the early steps of the process. It also implies the necessity of negotiating the project characteristics among the stakeholders of each project. Although the negotiating process is very important to ensure that the stakeholders perspective is taken into account in the project formulation, this work will focus on the use of the WWW to make the information available to the various stakeholders and to the public in general. Moreover, it is important to point out that this type of approach is not usually used in Portugal to solve environmental problems. However, this approach would enable EIA to reach solutions more appropriate to the stakeholders needs and interests.

In addition, the organization responsible for implementing such a system has to consider the difficulties of identifying the stakeholders and helping the stakeholders to organize themselves to present a perspective about the project and to publish it on the WWW. The way stakeholders are identified and selected is a very important task and it determines, at least partially, the credibility of such a system. In order to be successful this task should not consider only the stakeholders that manifest interest but it should search for existing interest groups and help the groups that are less organized to come forward and be part of the process. The identification of the stakeholders should be done through traditional techniques of conflict assessment. First the NGO should announce on the WWW and other media a description of the project and invite stakeholders to identify themselves. Then the NGO should conduct interviews to identify stakeholders that have not shown up. The NGO should also contact existing institutions in the area, such as churches and local organizations to help to identify stakeholders. The identification of

stakeholders is very a important step in the development of such a system, and it requires time and skilled people.

To get the various interest groups to present a perspective on the project implies the existence of technical support. The NGO has to help the interest groups, especially the less organized, to structure their perspective and gather the necessary information. These tasks are time consuming and require skilled people. The NGO should also develop an example of the potential of the technology in order to educate the diverse stakeholders. Besides this demonstration of the potential of the technology the NGO should also provide for training of the stakeholders.

Another aspect that should be considered is the allocation of resources among the stakeholders to develop the various perspectives. The existence of resources will influence the quality of the representations and therefore affect the understanding of the issues at stake. The allocation of resources should be clear in order to build credibility and confidence on the process and system. The funding of the NGO is also an important aspect to be considered.

Moreover, the implementation of the interactive project formulation model has to consider the cost of publishing the information on the WWW. This cost will be higher than IPAMB' costs since this system will include more information and will imply the use of qualified personnel to implement it. The implementation of such a model will require people skilled in computer science as well in negotiation process. Therefore, the cost of renting space on a WWW server would be higher.

The implementation of a WWW-based system to facilitate public participation implies the maintenance of a database that is always growing. This database could become a very useful source of environmental information. However, to take advantage of that database it would be necessary to index the information in order to allow for efficient searches. The WWW already has some searching engines that would have to be adapted to suit the characteristics of the information presented in a WWW system to facilitate public participation. The adaptation of the existing search engines requires programming skills. The implementation of this type of mechanism in the WWW-based system would increase the costs.

Another barrier to using the WWW to support a system to facilitate public participation is that programming skills are needed to implement certain mechanisms of interactivity. Hypermedia stand-alone systems allow an easier way to implement interactive

systems. To implement the same level of interactivity on the WWW requires more programming skills. For example, implementing an easy what-if scenario requires the development of a program. Therefore, if the organizations responsible for implementing the systems want to increase the interactivity of the system to, for example, allow the users to input their own data in simulation models, they will need a programmer to develop a program to allow users to easily do that. This will increase the implementation costs.

4.4 Summary

A WWW-based system to facilitate public participation can have different goals. The establishment of the goals is determined by the motivations of the institutions responsible for implementing a system to support public participation. The strategy of intervention described in this chapter aims to create 3 models of a WWW-based system that would be applicable to every EIA: (1) The top-down dissemination model. (2) The "watch-dog" model and (3) The interactive project formulation model. These models differ in terms of goals and institutional setting responsible for implementing such a system.

The top-down dissemination model intends to facilitate access to the information and allow a broader public to participate. The "watch-dog" model aims to engage a broader public in a discussion based on some stakeholders' interests. The interactive project formulation model intends to integrate the stakeholders' different perspectives in the system in order to allow the public to influence project definition.

The implementation of a WWW-based system depends on the type of model that is adopted. The interactive project formulation model is the model that faces more challenges since it implies a change in the rationale for supporting public participation as well as a change in the way the EIA process is organized. However, this model enables public participation to increase its influence in decision-making. The other two models are less ambitious. Nevertheless they facilitate public access to EIA information. The cost of a WWW-based system to facilitate public participation in EIA is also another impediment to implement such a system. The costs vary among the models. However, it is possible to estimate that the interactive project formulation model presents the highest costs.

CHAPTER 5. APPLYING THE STRATEGY

5.1 Introduction

According to the strategy of intervention, described in chapter 4, three different models can be considered in the design of a WWW-based system to facilitate public participation: the *top-down dissemination*, the *"watch-dog"* and the *interactive project formulation* models. The interactive project formulation model is the one that allows public participation to increase its influence. It is also the most complex model since it integrates the different perspectives of the stakeholders in one system. In order to illustrate such a model, I developed a prototype on the WWW using an hypothetical project where an EIA was needed. A hypothetical project was used since the development of the prototype only intends to illustrate the structure of the information and some of the communication mechanisms that such a system could include. The prototype presents one possible use of the Internet to inform the public and the stakeholders about a specific project.

The project consists of the renewal of an outdated industrial park into a recreational area. The project is located in Myhood, an hypothetical neighborhood in Lisbon. Myhood is loosely based on a real neighborhood in Lisbon, Olivais, located in the area of the EXPO'98. The project was conceived in order to emphasize the different perspectives of each stakeholder. In the development of the prototype, the use of images and videos was also explored to illustrate specific features of the area as well as some of the expected impacts.

In this chapter, I begin to describe a prototype developed to illustrate a WWW-based system to facilitate public participation. I then conclude with a brief summary of the major difficulties faced in the development of the prototype.

5.2 Development of the Prototype

The development of a prototype to illustrate the interactive project formulation model has to consider two main issues: the information to be included and the structure of the prototype. Although the case is hypothetical, it was necessary to define and collect the information that would be included in the prototype in a manner similar to an actual implementation. As this hypothetical situation is loosely based on issues surrounding EXPO'98, actual maps and imagery were used to illustrate the prototype's functionality.

The information in the prototype is structured according to the interactive project formulation model. Thus, the prototype will include the perspectives of the stakeholders about a specific project. However, the development of the prototype structure has also to consider the interactive mechanisms that should be included in the system. The prototype includes communication mechanisms, such as the possibility of sending and posting comments. The prototype also includes representation aids such as the possibility to visualizing impacts of the project on the landscape. The way the technology is used to implement such mechanisms affects the structure of the system.

The design of the interface is another aspect that has to be considered in the development of the prototype. The interface has to be simple and friendly considering the characteristics of the target users. The primary concerns with the design of the prototype's interface were to make the navigation of the system clear and fast by avoiding large graphics that would slow the system's interactivity.

The prototype was developed on the WWW using Netscape. An authoring tool, Adobe Page Mill, was used to develop the HTML pages. Image and video manipulation software specifically Adobe Photoshop, Adobe Premiere and Morphs were used to present some of the visualizations included in the prototype.

5.2.1 Information Included in the Prototype

The project used to illustrate the model of a WWW-based system is a proposal to renew an industrial area in Myhood, a hypothetical neighborhood located in Lisbon Myhood is a residential neighborhood, with the exception of an area that currently has an industrial use. This area has high potential to be developed for other uses, especially recreation, since it is located along a river. The industrial facilities in that area are outdated. Moreover, they are dangerous and highly pollutant. They have to be renovated and there is no reason why they should remain in the area. The owner of the land would rather move to another place where he can find cheaper land. He would like to change the area into a recreational complex.

The proposed project consists of demolishing the existing industrial facilities and building a marina and a sports pavilion. The current owner of the land wants to build a high quality recreational complex. This future use of the area has been the subject of some controversy. Different stakeholders have different opinions about how this area should be transformed.

In the development of the prototype, it was assumed that there would be an NGO responsible for implementing such a system. The NGO would identify the stakeholders and help them to develop and present their own perspectives. For the development of the prototype, the NGO, Givepeoplepower, has identified three different groups: the residents of Myhood, the proponent of the project and a group of environmentalists. In order to better illustrate the difference in perspectives among the stakeholders, the opinions expressed by the stakeholders reflect very stereotypical behaviors. All the stakeholders agree to publish their views on the WWW in order to inform the public and the other stakeholders. They also are committed to receiving feedback from the public about the problems considered.

The residents of Myhood are pleased to see the area renovated. They think that the construction of a marina and sports pavilion will increase their property values, so they are generally favorable about the proposal. Access to the recreational facilities and particularly to the sports pavilion is one of the residents' main concerns. They complain that Myhood does not have any sports facility. They are also worried about possible increases of noise and traffic in the neighborhood as a result of the project.

The proponent of the project wants to build a high quality marina and a sports pavilion. He is very worried about the clean up of the site in order to get the quality he desires for the project. He considers that the impact of the project is going to be positive since it will renew a degraded area. The marina is his major priority because it is where he would earn the most profit.

The environmentalists agree with the shut down of the industrial facilities; in fact, they have desired it for a long time. They also support the demolition of the existing facilities. However, they are very worried about the clean up of the site. The environmentalists are also worried about the construction of a marina. They think that the construction of the marina will negatively affect a natural reserve located upstream from the river. The environmentalists are convinced that the construction of the marina will increase water pollution as well as stress the endangered wildlife species existing in the natural reserve.

Although the project is completely fictional, it uses images and videos from real cases, especially from EXPO'98, which is a world exhibition that will take place in the

eastern part of Lisbon during the summer of 1998.[34] A team of researchers at the National Center for Geographic Information (CNIG) in Portugal and at the Environmental Systems Analysis Group in the New University of Lisbon are using the EXPO'98 project information to produce a CD-ROM that intends to give EXPO '98 visitors the opportunity to explore the environmental history of the area. The EXPO '98 is also being used by Alexandra Fonseca at CNIG, to illustrate her research of multimedia spatial information systems within the EIA. The development of the CD-ROM and the research conducted by Alexandra Fonseca provide useful multimedia data of the area to illustrate parts of my structure.

5.2.2 Application of the Interactive Project Formulation Structure

The prototype was developed based on the structure defined for the interactive project formulation model. It consists mainly of the integration of the stakeholders perspective about five main issues in a project: location, description of the project, characteristics of the area, impacts of the project and mitigation measures. To help the different stakeholders structure their presentations, the NGO would provide them with a set of questions. The NGO would also provide a set of analytical tools that would allow the public and stakeholders to interact with the information presented. In order to better understand the structure of information, I describe the major points of view of the different stakeholders. Moreover, I describe future developments that should be incorporated in the prototype in order to increase its interactivity.

The prototype starts with a page that includes a list of projects currently undergoing a public participation process (Fig. 5.1). On that page, the NGO explains the purpose of having different perspectives on the WWW and how the system works. The page also has an explanation about the NGO and it provides a linkage to the NGO homepage. The inclusion of information about the NGO is important for providing credibility to the system.

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[34] The implementation of the exhibition implies the construction of pavilions and creation of facilities to support the expected 9 million visitors. It will require major land-use changes since the eastern part of the city has been traditionally an industrial area.

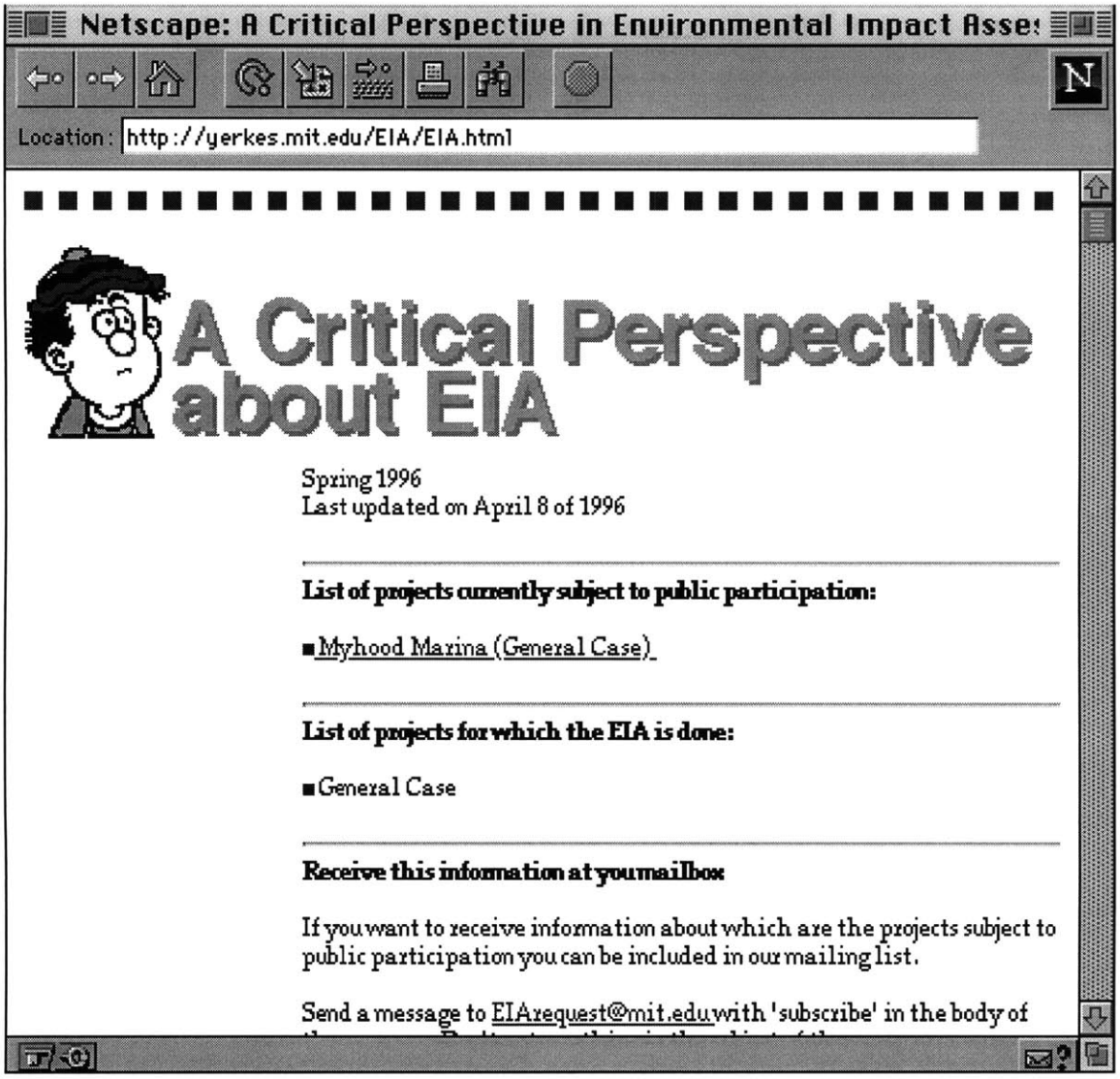


Figure 5.1 Illustration of the starting page of the prototype

From the first page, the user can select the Myhood Marina project. This project intends to illustrate the structure for a general case. The page about the Myhood Marina provides a brief description of the project and its location. It identifies the stakeholders for that specific project: the residents of Myhood, the proponent of the project and a group of environmentalists. This page also gives a linkage to the five issues of each project: location, description of the project, characteristics of the area, impacts of the project and mitigation measures.

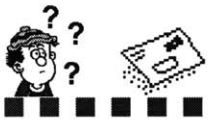
5.2.2.1 Location of the Project

If the user chooses to view the location of the project s/he will access a page including a generic map showing the location of the project (Fig. 5.2). This page includes the following NGO questions :

- What is the location of the project?
- What are the boundaries of the impacted area?

From that page, the user can access the points of view of each stakeholder. Each stakeholder presents a map of the location of the project at a bigger scale. This map gives access to a more detailed map or aerial photograph that presents the limits of the project and the boundaries of the area of impact. The area of impact changes according to each stakeholder. For example, the developer considers the area of impact as only the area adjacent to the piers. The residents include their neighborhood in the indirect impacted area. The environmentalists define the area of impact according to the environmental variables they are considering. For example, in the impacts on fauna and flora they include the natural reserve, located upstream from the river in the impact area (Fig. 5.3).

In future developments of this prototype, the users should be able to define what they think the area of impact is. The system would include a map where the users would draw the boundaries of the area of impact. Another future development should be to allow the users to visualize the differences in the areas limited by the different stakeholders. The users should also be able identify an area in a map and find out if that area is included in the area of impact of any stakeholder. These queries about the perspective of each stakeholder can be done dynamically or they can make use of pre-conceived sets of information. The development of a dynamic mechanisms implies the linkage of the WWW with a geographical information system. There are some technical problems that may result and these should be investigated further. The use of pre-generated maps in order to answer the questions of the users is more limited in terms of answering the users questions and requires more disk space. However, it requires less computational power and it is easier to implement.



Location of the Project

The proponent UrbanDeveloper wants to renew an area in Myhood and build a marina. Myhood is located in the Municipality of Lisbon.

In order to determine the location of Project X we asked the 3 stakeholders the following questions:

- What is the area of intervention of the project ?
- What are the impacts boundaries of the project ?

We present a map with the generic location of the project. Each stakeholder presents more detailed maps.

What does each stakeholder say about the location of the project.


The Proponent


The Environmentalists


The Residents

If you click in any of these groups you will find out what they think the location of the project should be.

Your Opinion Matters:

If you want you can also leave you opinion here about the area of the project and its impact area. You just have to click here

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Contact Person

(Contactperson@responsibleinstitution.pt)

Figure 5.2 Illustration of the location page included in the prototype

Location of the Project

This part will include the desription of the location of the project according to the environmentalists

The marina of Myhood is located in the municipality of Lisbon and it is limited by xxx and by xxx. It occupies an area of xx hectares in the eastern part of xx, stretching xx km along the banks of the river xx.

We consider that the area of impact is different according to the environmental features studied.

We defined the area of impact for the following features:

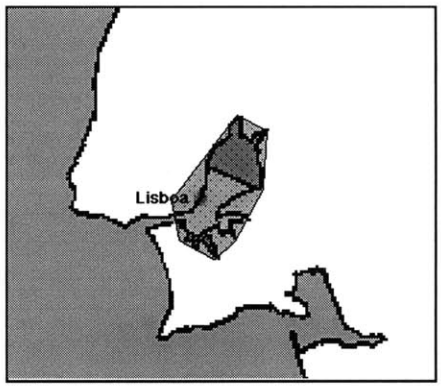
- Socio-economics, air pollution and noise
- Natural Resources

Please click on any group of environmental features to see a map with the area of impact.

We consider this approach more reasonable specially when important natural resources are at stake.

Impact Area for socio-economics, air pollution and noise

Impact Area for Natural Resources



Direct Impacts Indirect Impacts

Limit of the Project Area

Please click on the maps to see some pictures of the area.

If you want to know if a specific street is included in the area of impact defined by:

The Proponent √

please type the name of the street here:

Submit Reset

What does each stakeholder say about the location of the project.

The Proponent The Residents

If you click in any of these groups you will find out what they think the location of the project should be.

Contact Person

(Contactperson@responsibleinstitution.pt)

Figure 5.3 Illustration of the location page presented by the environmentalists included in the prototype

5.2.2.2 Description of the Project

If the user goes to the project description, s/he accesses a rough project description, written by the NGO with the purpose of identifying the project stakeholders. The user accesses the following questions:

- What is the purpose of this project?
- What are your interests in the project?
- What are your concerns about the project?
- What are the viable alternatives to this project? (consider technological and design alternatives as well as location alternatives)
- What are the steps that need to be taken to build the project?
- What is the relationship of this project to other planned activities?

The NGO will help each stakeholder provide a sketch or a 3-D model of their vision of the project. In order to facilitate this task, it would be necessary to develop a tool that would help to create these representations. This tool could be developed by creating a set of question in terms of physical dimensions and other architectural and landscape design issues. The answers to these questions would be introduced on different softwares to produce a vision of the project. In this process the NGO could make use of a digital library of design objects such as trees, bridges and urban equipment. The production of such tool should be further investigated. Ideally, such a tool is user-friendly and allows the users to easily produce their own vision of the project. However, the realization of such a task has some technical problems that are difficult to resolve.

In the Myhood marina project, all stakeholders agreed that there was a need to shut down the industrial facilities and give a different use to the area. However, the interests and concerns vary according to each stakeholder. The developer mainly wants to build the marina since he thinks that there is high demand for recreational harbors. In his opinion, Myhood is the best spot to build a marina.

The residents are mainly interested in having a sports pavilion with a swimming pool, which is not in the developer's project. Although, they agree with the construction of the marina, they are concerned about the noise and traffic the project is going to generate.

The environmentalists are interested in having a sports pavilion and other facilities such as a park, in the neighborhood. They also are interested in promoting the connection

between Myhood and the river. They do not want any marina since they consider that a danger to the natural reserve.

The alternatives presented vary according to each stakeholder's interests. The developer and the residents do not present any alternative, although the residents propose a swimming pool in addition to the developer's project. The environmentalists do not want to build the marina. Instead, they prefer to improve the marina located south of Myhood, far away from the reserve. They also propose a different location for the sports pavilion in order to facilitate the connection between the neighborhood and the river.

Future developments of the prototype should include a list of all alternatives presented by the stakeholders. The information will be organized in order to show the differences between alternatives. For example, if the alternatives presented by the stakeholders are different in terms of location of the project the user should have access to a map showing the differences.

5.2.2.3 Characteristics of the Area

In the description of the characteristics of the area the NGO presents the following questions:

- What are the more relevant environmental and social characteristics of the area?
- What are the sources of information you used?

Once again the perspectives of each stakeholder about the more relevant characteristics are different. The developer chooses the contamination of the soil and the outdated industrial facilities as the principal characteristics of the area. The sources of information used by the developer include field sampling of the soil's contaminants. The residents pick the proximity of their neighborhood to the river as the principal characteristic of the area as well as the levels of existing traffic and noise. The environmentalists pick the river and the proximity of Myhood to the river as the principal asset of the area. They relate this location to the proximity of an important natural reserve. They also point out the contamination of the soil as an essential feature.

Each stakeholder presents images and videos of the area with emphasis on the feature they consider most important. The environmentalists present a simulation showing the soil contamination. In future developments of the prototype, it should be included the

possibility to search for a specific feature, for example noise, and find out which stakeholder choose that specific feature and what do they say about it.

5.2.2.4 Impacts of the Project

In the Impacts pages, the user can access the following questions:

- What do you think are the most troublesome impacts of the project?
- Which important features of the area should be preserved?
- In what time frame should the impacts of the project be considered?
- If no project is to be built in the area, what is going to change in the area anyway? How?
- What are the indicators that best show the impacts of the study?
- How would you calculate and estimate them? (If you use models, please specify)
- How is each indicator going to be affected?
- If you change your importance criteria, how are the indicators going to change? Over what time period?

The developer considers that the most troublesome impacts will happen in the construction phase of the project. The demolition of the existing industrial facilities will cause the most important impacts. In addition, the developer considers that some negative impacts will occur in the exploration phase of the marina. These impacts will affect the quality of the water and will occur because of boating activities, that result in such things as small oil spills. In his opinion, if no project is built, the area will be affected negatively since no cleanup of the site is going to happen. As indicators of the impacts, the developer proposes the following two: air quality index and water quality index.

The residents of the area identify the decrease in air quality and increase in noise due to the increase of traffic as the most important impacts. They feel that the character of the neighborhood should be preserved. They are worried that if no project is approved, the current industrial area will become vacant land. Therefore, they would rather see a marina and a sports facility in the area. Further, residents are concerned about crime and safety in the neighborhood. In their opinion, the best indicators are the noise produced and the emission of hydrocarbons.

The environmentalists are worried about water quality. They think that the construction and exploration of the marina will increase water pollution and will have significant impacts on the natural reserve. The connection of the neighborhood with the

river is one aspect that they would like to see preserved. If no project is going to be built the environmentalists think that the contamination of the soils will still be a problem. They think that the air quality will improve since the industrial facilities will be closed. The best indicators, in their opinion, are a water quality index and an air quality index.

The diverse stakeholders present some photos and images to show the characteristics they want to preserve, as well as some simulation of the visual impacts. For example, the proponent presents a simulation showing the visual impacts of demolishing the existent facilities.

In future developments of this part of the prototype, two main components should be considered: prediction of impacts and evaluation of impacts. In the prediction of impacts, the prototype should include the means to access the methodology used by each stakeholder to calculate a specific index. For example, it should be possible to understand what were the parameters used to calculate the water quality index; for one stakeholder this index can be based on the pH and color of the water, and for a different stakeholder the water quality index can be calculated based on dissolved oxygen and turbidity. Users could also be able to search for a specific parameter, and see which stakeholder has considered it in the calculation of a specific index.

It would also facilitate the transaction of information if the system could help a user that is concerned about one potential impact but does not know which parameters are used to measure such a problem. The system could include a list of problems and the parameters that can help monitor each problem. For example, if a user is concerned about the corrosion of a sewage system he could look up a list of possible water problems and see which parameters show the potential of the waste water to destroy the sewage system. In this case, pH would such a parameter. This would help the user to change the relative weight of a parameter used to calculate a specific index, since the system would inform the user about the meaning of different parameters. In addition, the system should also include a glossary. This glossary would allow users to understand the meaning of the parameters. Moreover, the system should include a list of environmental standards established by law. The user could then, for any value of predicted impact, question if the value was according to legal standards or not.

For the prediction of impacts, it would be interesting to allow users of the system to play "what-if" scenarios. An excellent example of this type of "what-if" scenarios is presented by Shiffer (1993) in a project for the reuse of an Air Force Base. In that

example, the user can choose the type of airplanes that will use the airport and hear the resultant noise, according to a specific chosen location. The "what-if" scenarios could use the models that are already used to predict impacts. The user would be able to change the initial conditions of the model and see the results. Moreover, the results obtained from the user's initial conditions would be compared to the results of each stakeholder that has used the same model.

In the evaluation of impacts the prototype should include an interactive sensitivity analysis, so users could experiment with changing the importance of the parameters and then obtain the respective value of impact. This interactive sensitivity analysis would include a list of indices considered by each stakeholder in his/her impact analysis and their respective weights. The user could change the weights of each index. The interactive sensitivity analysis would also include a matrix with the different alternatives and the impacts of each alternative with the different index. When the user changes the weights of the indices it would modify the values of the matrix. Therefore, the user could get a value for the different alternatives. The user would have the opportunity to evaluate whether the changes s/he has done in the relative weight of each index would produce a rank of alternatives that is in accordance with the user's priority.

5.2.2.2 Mitigation Measures

If the user wants to consult the mitigation measures proposed by the different stakeholders, s/he will access the following questions:

- What mitigation measures do you propose?
- What are the expected impacts of the project after the mitigation measures are applied?

In order to facilitate the proposal of mitigation measures by each stakeholder, the system should include a database with a list of types of mitigation measures. For example, if a stakeholder is concerned about noise and wants to propose some mitigation measures, s/he could search for the word "noise" and would get a list of mitigation measures, such as acoustic barriers. Then, the stakeholder could choose the measure s/he thinks is most appropriate. This library of mitigation measures would be updated with examples proposed in other projects. The information included in this library should be as comprehensive as possible. For example, each mitigation measure should include information about the amount of reduction of impact as well as the problems such a mitigation measure might have. It could also include a list of projects where that type of

mitigation measure has already been implemented. Images to illustrate the mitigation measures and its implementation should also be included.

In the Myhood marina, the developer proposes some construction practices such as wetting the ground in order to diminish the emission of dust during demolition. He also proposes the construction of sanitary facilities and other support facilities to the marina activities in order to diminish the impact to the water quality. According to the developer, these measures will not eliminate the impact, but will decrease it. The residents propose a different location for the access route to the sports pavilion as well as the implementation of a bus route to the area in order to diminish the traffic volume. The environmentalists propose a decrease in the number of boats to the marina. They also ask for sanitary facilities. They propose that a sewage system be implemented in the area to collect and treat waste water produced as a result of the marina and the sports pavilion activities before it is dumped in the river.

The interactive mechanisms implemented in this prototype are mainly communication mechanisms. However, there should be more interactive mechanisms especially for searching information. The communication mechanisms are mainly asynchronous mechanisms. Every page belonging to each stakeholder allows an e-mail to be sent to the owner of the respective page.

Each page gives access to a bulletin board about a specific topic (Fig. 5.4). This bulletin board allows users to send their opinions about one aspect of the project and to receive an answer. The comments posted by the user are structured according to a set of questions. For example, in the case of the location of the project, the comments page asks the users if they agree with the delineation of the area of impact done by any of the stakeholders, and why. The comments page also asks the users if they identify with any stakeholder group. Any stakeholder can answer the posted questions. This bulletin board will also be accessible from the NGO page about each component of the study. One of the roles of the NGO would be to manage the information included in the bulletin board, in order to prevent inappropriate messages from overloading the system.

Please fill this form in order to send a question or comment about the location of the project.

Your message will be posted in the page of comments about the location of the project, allowing other users to read it. If you do not wish other people to have access to it please click here before you write your comment.
If you have any question or comment about the location of the project you are in the right place!

Your Name

Your e-mail

Organization

Do you consider yourself as part of any of these groups?

- Residents of Myhood √
- Proponent
- Environmentalists
- Others

What do you think about the location of the project?

What do you think about the impact area of the project?

Any other comment?

Submit Reset

(Contactperson@responsibleinstitution.pt)

Figure 5.4 Illustration of the comments page included in the prototype

Future developments of this communication mechanism would include mechanisms to search for comments about specific questions. It would be interesting to have graphics showing how many users have made comments about a specific topic and what their opinions were. It should also be possible to know from which group the comments came from.

The prototype also includes some representation aids in order to provide for more descriptive representations of the real case. The representation aids are included in some stakeholder's information when they make use of visual simulations to illustrate some issues. For example, in the prototype, the environmentalists use a video to show the concentration of the soil contaminants at depth. Another example of representation aids is an illustration of the impacts of demolishing the existing industrial buildings in the landscape provided by the developer.

The design of the interface has one main goal: to facilitate navigation through the system. Therefore, the pages of the NGO and of the different stakeholders are differentiated by color. For example, in the prototype, the environmentalists' pages are in green and the proponent's pages are in yellow. Another aspect of the interface is that most information is presented in the form of bullet points in order to provide easy access to the information. The system also has an index that lists all the questions made by the NGO. From this index, the user can access the answer to that question from each stakeholder. It is possible to access the "comments" page and the index from every page of the prototype.

5.3 Major Difficulties

The major difficulties found in the development of the prototype are mainly related to information gathering and to increasing the interactivity of the system. Gathering information is usually a time consuming task. The use of an hypothetical project simplified this task since information developed for other purposes could be used to illustrate the concepts at stake. However, there is not much information produced to illustrate environmental impacts to the public. In addition, no research has been done to provide guidelines to produce visualizations of environmental problems aimed at facilitating the understanding of environmental problems by the general public. In the development of this prototype I used animations produced for the EXPO'98.

The production of multimedia information to illustrate the project and its impacts is not an easy task. To produce animations to illustrate some features of the projects, such as

a flight through a 3-D model of the project, requires technical expertise in different visualization software. It also can be very demanding in terms of computational power. In addition, the animations developed usually require large amounts of disk space. Moreover, the development of such visualizations is a time consuming task. Recent developments in the WWW, such as Virtual Reality Modeling Language (VRML), promise to simplify this task and improve its capabilities. The use of such tools should be further investigated.

The information gathering has to consider the disk space available on the server as well as the amount of time it takes to transfer such information through the WWW. The application of the structure of the interactive formulation model showed that if the system includes several images and videos for each stakeholder, the requirement of space increases dramatically. For example, one video used in the prototype to show a 360° perspective of the area requires approximately 2 Mb of disk space.

If the images and graphics included in a page are big in size, they will slow down the transfer of information through the Internet. This slowdown affects the usability of the system. To avoid this problem, most of the images included in the prototype were reduced in size before being included in the system. Another issue that has to be considered is that in order to visualize a video, users have to have available space on their own hard drive. Therefore, the size of the videos or animations included in the system will limit the number of users who will transfer that information into their hard drives. This issue will become less critical as "videos-streamers" technologies are developed.

Another challenge in the elaboration of the prototype was the development of interactive mechanisms. The interactive mechanisms existing on the WWW, such as the possibility to fill a form and send the information by e-mail, require a Common Gateway Interface (CGI) program. The CGI program is usually written in a programming or script language, such as C or Perl, and allows users to interact with the information presented on the WWW. In the prototype, pre-existing CGIs were used to implement some of the communication mechanisms, such as the possibility of sending a comment and having it published on a specific page.

The use of pre-existing CGIs can limit the goals of the interactive mechanisms since they are limited by their flexibility. For example, the way the comments page is implemented so that the messages are listed according to their order of arrival. It would be more useful to the user to have the messages listed by the topic of the message. This would facilitate the search for specific information. In addition, it would have been

interesting to allow people to answer a specific comment instead of having a list of comments by order of arrival. However, the CGI used did not offer these functions. If the development of CGI's were easier, more interactive mechanisms would have been implemented. For example, one mechanism that would be interesting to include in the prototype would be to allow users to change the weight of certain variables and see differences in the expected impacts of a specific project.

The development of the prototype allowed me to illustrate the application of the interactive project formulation model. Since the project used for the development of the prototype was a hypothetical one, it did not allow me to test the structure and the implementation of such a system. Therefore, a real case should be used to evaluate the proposed structure and the implementation of a WWW-based system to facilitate public participation. Moreover the prototype lacks of some of the human-computer interface mechanisms that are very important to facilitate the interaction with the users and the system.

CHAPTER 6. CONCLUSIONS AND ISSUES FOR FURTHER RESEARCH

6.1 Conclusions

Public participation in EIA in Portugal is mainly constrained by the characteristics of the EIA process: decisions are generally made before the EIA process starts, and the EIS is a political instrument that contains value judgments. Moreover, the dominant rationale behind the support of public participation is the desire to increase the perception of legitimacy by the public and by the European Community. Therefore, public participation is included only in the late stages of the process, when the most important decisions have already been made. Public participation chiefly consists of the dissemination of the information included in the EIS. It happens only after the Environmental Impact Study (EIS) is done.

This model of public participation is directed to a technically educated public, since it requires a public capable of assimilating all the technical information presented in the study. Even those citizens sufficiently educated to be able to understand the information presented have no assurance that their opinions will be taken into account in the decision-making.

In addition, public participation is also limited by the way it is organized. The analysis presented in Chapter 2 indicates the following impediments to public participation: insufficient invitations to participate, difficult access to the EIS, and inadequate answers to the questions raised by the public. Another aspect that also limits public participation is the way information is presented. An EIS is generally written using technical language and lacking representational aids.

Nevertheless, public participation is considered useful both by people in public administration and by the general public. There are technicians and elected officials that defend public participation as a way to share decision-making and consider the public a source of knowledge. This perspective has allowed changes in the way public participation is organized, such as the selection of an institution responsible only for coordinating public participation in EIA. This change has allowed a better organization of public participation and as a result more people have participated in the EIA process. Environmentalists regard the public participation process as an opportunity to get to know a project better, to express their opinions and to create political pressure to influence decisions. The participation of

environmental organizations in EIA has resulted in changing and even stopping some projects.

The Internet, due to its unique characteristics, could be used to facilitate public participation in EIA. It reduces constraints of time and place to the access of information, and it provides for several communication mechanisms, such as e-mail. These two characteristics can help to facilitate access to the EIS as well as to improve communication among stakeholders. The development of the WWW has brought to the Internet the possibility of structuring information in an associative manner. The WWW also allows the presentation of different representations of the information through the use of images and videos.

The use of the Internet to facilitate public participation is limited by the degree of public access to the technology and its familiarity with that technology. Therefore, the characteristics of the Internet users have to be considered. Presently, the Internet in Portugal is used by only a part of the EIA stakeholders, mainly university professors and students, and members of some other organizations, such as government ministries. Internet users in Portugal have higher educational and income levels than the general population. They access the Internet at their work and in school. The majority of the Internet users are located in urban areas, in contrast with the EIA participants, who mainly come from rural communities.

Nevertheless, the number of people on the Internet is growing. Since the Internet is a relatively new infrastructure, one that has changed significantly in the last couple of years, it is very difficult to make a reliable forecast as to the future of the Internet. In order to address this problem, I considered three scenarios:

- **Scenario 1.** The use of the Internet will continue to be restricted to an elite group of users, mainly connected to universities and research and governmental institutions. Although the use of the Internet will increase, it will not expand to a large proportion of households. The cost of hardware and of being connected to the Internet will remain too high for most households. Moreover, the setup of such a system and its interface will exclude citizens with a low level of computer knowledge from becoming regular users of the Internet.

- **Scenario 2.** The use of the Internet will expand to a substantial number of households (around 30 to 50 % of all households). It will also be used largely by businesses and organizations, such as NGOs. However, the use of the Internet will still be

constrained by access costs and by the user's level of computer knowledge. These two factors will exclude a substantial part of the population from using the Internet. Internet users will have higher incomes and be better educated than the general population. Although the information available in Portuguese through the Net will increase, most of the information will still be in English. This limitation will also skew the distribution of Internet users across the whole population. Within this scenario, the use of the Internet will still be more frequent in urban areas where the use of computers is common. Some information will circulate only on the Internet. Therefore, to avoid exclusion of certain sectors of the population, there will be a need to provide access to the Internet through public places, such as libraries, City Hall, and street kiosks.

- **Scenario 3.** Nearly all homes and businesses will be connected to the Internet. This web of digital connections will support commerce, learning, education and entertainment (Kapor, 1991) and, it is hoped, will include a system to allow the public to participate in EIA. The connection would not be made through traditional personal computers but through the use of a box connected to a TV, the Internet appliance (Kapor, 1996). The cost of such an appliance would be low enough to allow a majority of the population to be connected to the Internet. To "surf" the Internet, the user will need only a remote control. To allow the user to send information, the box will include voice recognition mechanisms. Therefore, users will not need to know about computers in order to have access to the Internet. In this scenario, the inability to work with computers will not be a barrier to people who wish to access information on the Internet.

At present, the development of the Internet in Portugal is at a stage equivalent to the one presented in scenario 1. However, in my opinion, in a range of 3 to 5 years, scenario 2 will become reality. The realization of scenario 3 will depend on the resolution of the existing technical problems that the development the Internet appliance presents. However, the fast development of the Internet and of the technology in the past years made me think optimistically about the realization of such a scenario in the near future.

The future of the Internet and its perception are very important since they will provide the motivation for implementing a WWW-based EIA system. Moreover, the number and characteristics of the Internet users, in the present and in the future, will determine the design and goals of a WWW-based EIA system to facilitate public participation in Portugal. Therefore, the above three scenarios of Internet development should be considered in any decision about the characteristics of the system. In order to

explore the potential of the Internet to facilitate public participation, I have proposed three models of a WWW-based system:

- The **top-down dissemination** model that is designed to use the WWW to disseminate EIA information. This type of model will involve the public only in late stages of the process.

- The **"watch-dog"** model that is designed to allow diverse stakeholders to monitor the action of the public administration and disseminate their opinions about the EIA information presented by the public administration. It assumes that the public administration uses the WWW to disseminate EIA information. Like the top-down dissemination model, the public will be involved only after the EIS is done.

- The **interactive project formulation** that is designed to allow every stakeholder to express his/her perspective about the project. In this model the public is involved from the beginning of the EIA process, that is, from the conception of the project. The organization of the process of identifying the stakeholders and helping them to present their perspective would be the responsibility of an NGO. The main role of such a NGO would be to ensure a fair representation of each stakeholder.

The selection of one of these models will depend mainly on the rationale for supporting public participation, as well as on the extent of the Internet development. The top-down dissemination model implies that the motivation to support public participation is still only a desire to increase the perception of the legitimacy of the decisions. The implementation of such a model would not replace the traditional mechanisms for involving the public. This means that a public without access to the technology would not be excluded from participating in the EIA process. The implementation of this model intends to facilitate the access to information to certain groups of the population, such as university professors. Therefore, this top-down dissemination model would be chosen if scenario 1 of development of the Internet happens.

The implementation of the watch-dog model assumes that the rationale for supporting public participation is, as with the top-down dissemination model, to increase the perception of the legitimacy of the decisions. However, in this scenario, stakeholders, such as environmental organizations, also have access to the Internet. Therefore, the implementation of this model is more probable if scenario 2 happens. Stakeholders would also use the Internet only to disseminate their opinions about the study. The implementation of this model would allow organizations that demand a more active voice in

the decision-making process to reach a larger public. Although this type of model can generate some public action about a project, it will provide incentives for pursuing litigation. Moreover, the public will not have any assurance that their opinion will be taken into account.

In contrast, the interactive project formulation model allows public participation to really increase its influence in decision-making and project definition. However, the implementation of the interactive project formulation model implies a change in the way the EIA process is organized. Not only will the public be involved from the beginning of the process but also the EIS will result from a collaborative effort of all stakeholders. It is the use of the WWW that allows the development of a collaborative EIS. Due to the way information is structured, the WWW allows the simultaneous presentation of the stakeholders' perspectives about a project.

However, the implementation of such a system implies that the public in general has access to the Internet. The effort to implement such a system is more justifiable in the case of scenario 3. In the interactive project formulation model, the information presented by the stakeholders is only available through the WWW. Therefore, if this model is selected, planners should be concerned about providing access to the technology to the whole population. There should be a public access location, such as public libraries or town council offices, where people can access the WWW. Another option to providing access to the Internet could be through the stakeholders involved in each project; that is, the representative of each stakeholder would have access to the Internet and would facilitate access to the information to its constituency. The implementation of this model of providing access to the Internet would require training the stakeholders. The way to provide access to the technology should be further investigated.

As a planner, one should strive for the implementation of the interactive project formulation model since it increases public participation influence and allows the planner to elaborate projects and plans more adequate to the public's needs. Moreover, the implementation of such a system will allow the learning process in EIA to increase since the NGO responsible for implementing such a system would bring the knowledge from one project to the other. However, given the Internet development and especially the existing motivation and tradition of public participation in Portugal, it would not be surprising that the other two models would be implemented first. The implementation of these two other models will bring benefits to the EIA, such as reaching a more diverse public. In addition

it will increase the public's and the diverse stakeholders' familiarity with the technology. This factor can also support the future implementation of the interactive project model.

The structure and information gathering proposed for the interactive project formulation model represents a starting point to implement such a system. It is expected that over time the model will change its structure as well as the information gathering process since the implementation and acceptability of this model will change the rationale for supporting public participation. Not only the attitudes of the proponents and decision-makers will change but also the public's attitudes. The public, will feel that they have the power to affect decisions, and therefore will be less passive and demand more of the proponent and decision-makers. The proponent and decision-makers, on the other hand, will understand the benefits of public participation and will become more willing to comply with the public demands. One of the main implications of this positive feedback mechanisms is the establishment of requirements to produce an EIS. It is expected that the proponent will be required to provide real alternatives to the project. In addition the process of data collection that in the proposed structure is the NGO's responsibility will be shared with the proponent and decision makers. They will make an effort to provide the information that the stakeholders can use to produce their own perspective. The implementation of the interactive project formulation model will also allow to increase the learning process in EIA, since the NGO will carry the experience of one project to another. This factor will also increase the requirements of the system. It will induce a bigger effort to develop more interactive mechanisms.

6.2 Research Issues

This thesis has focused on providing a framework to design a WWW-based system to facilitate public participation in EIA. However, there is still a considerable amount of work that must be done to fully explore the concepts involved in the design of such a system, particularly when considering the implementation of the interactive project formulation. It is especially necessary to explore the impacts of using this technology in the public discourse. As a result of the work done in this thesis, three main areas should be further investigated: (1) What are the problems implementing a WWW-based EIA system? (2) What will take to sustain such a system? And (3) how it is possible to evaluate the usage characteristics of such a system?

6.2.1 Implementation of the System

The implementation of the interactive project formulation model requires further analysis of the following issues: the role of the institution responsible for implementing such a system, the negotiation process necessary to produce a collaborative EIS, and the assessment of its cost effectiveness.

In chapter 4, I proposed that a NGO should be created to implement the interactive project formulation model. That NGO should be constituted by individuals that are interested in increasing public participation influence. However, in order to implement such a system the role of the NGO has to be accepted by the stakeholders and by the public agencies presently with responsibilities in the EIA process. Therefore, the way the NGO should approach the stakeholders should be studied in more detail.

In addition, the NGO has a double role: it is the mediator among the stakeholders to allow the different perspectives to be incorporated in the definition of the project, and it gives technical support to each stakeholder to present his/her perspective on the WWW. This will bring issues of credibility to the NGO role since the NGO will have the power to influence the way each stakeholder's perspective is presented. Being a mediator does not mean that the NGO members do not have values that can influence the process. In a traditional mediation process one way to overcome this problem is through the establishment of a contract where the roles of the mediator and the other interested parties are very clear. This could also be the solution for this case. However, the NGO's double responsibilities and the means to avoid the erosion of NGO credibility are issues that should be further analyzed.

Another important question is how is to fund the NGO. Some funding schemes, such as having sponsoring institutions, could be developed. However, the willingness to fund such an NGO depends on the acceptability of the NGO role by the public and existing institutions.

The model implies that an NGO will identify the interested stakeholders for each process. After the stakeholders are identified, the NGO must have them indicate a representative that will be responsible for developing a WWW version of each stakeholder's perspective. This process of getting representatives of the different groups is especially important in groups difficult to represent. A process has to be designed in order to ensure that the decision that affects the presentation of the perspective on the WWW has the support of the respective constituency. Moreover, the procedure for the negotiation

process among the stakeholders has to be further analyzed. One of the areas of research is how the use of a WWW-based system can influence that process.

The benefits mainly stem from ensuring the right of the interested public to affect the project definition. Therefore one can assume that the projects will be more adequate to the public's needs. The costs of implementing the interactive project formulation should be further investigated.

6.2.2 Sustainability of the Technology

The potential of the WWW to facilitate a sustainable public participation is related to the following characteristics: hypermedia structure, interactivity, and several communication mechanisms. The interactive project formulation model explores the use of these characteristics. However, these characteristics could be further explored in order to take full advantage of the WWW potential to facilitate public participation.

Considering the hypermedia structure, the interactive project formulation model takes advantage of the use of images and videos that can create compelling representations of the each stakeholder's perspectives. However, further research should be done in order to develop routine methods of creating representations of environmental phenomena.

One of the main drawbacks of the technology is the relatively reduced interactivity that the WWW allows one to implement at the time of this writing. Future developments of the technology should allow for higher levels of interactivity, without requiring the use of programming languages such as C or Perl. The problem of using these languages to develop interactive mechanisms is that it requires specialized training. Although this does not have implications in the use of the system it has implications for the development of the system and therefore in the allocation of the NGO resources. This makes the implementation of a system to facilitate public participation more difficult since it would require the NGO to spend time and resources in the programming tasks to implement the system instead of helping the stakeholders to present their perspectives about a project. Authoring programming languages, such as Hypertalk (the language of Hypercard) should be developed in order to routinely create interactive applications. One such authoring language at the time of this writing is Java™. This language still requires programming skills, but has considerably increased the flexibility and the interactivity of the WWW. The benefits of using this type of language should be further investigated.

The interactive project formulation model should include interactive mechanisms such as the possibility of playing "what-if" scenarios. One idea is to allow the user to change specific conditions of the models and run the models again to get the results. The system should also include an interactive sensitivity analysis. For example, the users could change the importance of each variable and see the results on the expected impacts. Another mechanism that could be interesting to explore would be to give the opportunity to the users to limit in a map the area of impacts and post that information. This has some technical problems, such as how to implement an interactive drawing tool. The use of Java™ could be one possibility to overcome some of these problems.

The communication mechanisms available in the Internet should be further explored to allow the exchanging of information among the stakeholders and the general public. The structure proposed includes the use of e-mail and bulletin boards. The system could include the structured comments for the users to express their opinions about a specific problem. This would allow for an easier compilation of the comments and facilitate the management of the system. Other communication mechanisms and their effects should also be explored. For example, it would be interesting to explore the use of videoconferences.

The implementation of the interactive formulation model implies the creation of a large data set for each project. Therefore, problems of data management will arise. One problem is to ensure that all linkages in the system are working. This can be a problem especially if one considers that the perspectives of each stakeholder are going be modified along the process. Software such as Adobe SiteMill facilitate the management of the WWW site; however, a structure for organizing the data is also needed.

Another problem that arises from having a large database is the creation of search mechanisms that would facilitate the exploration of the information presented. The WWW already has some search engines. However these engines should be customized to the specific needs of a WWW-based system to facilitate public participation in EIA. Criteria to index the information should be further established to create more adequate search mechanisms. The index criteria should also consider the possibility of using such a database for different purposes. This is especially important in the Portuguese context where there is a lack of environmental data.

6.2.3 Usage Characteristics and Evaluation of the System

The evaluation of the system should consider two main questions: Did the use of the system allow public participation to increase influence? And did the way the information was presented facilitate public understanding of the project and the interests at stake? In order to respond to these questions, metrics to evaluate such issues have to be developed.

One approach could be to develop an experiment. The experiment should include all the steps required to implement such a system, starting with identifying and organizing the stakeholders to present their perspective. It should also include the selection and gathering of the information to incorporate in the system and the production of representational aids. The participants should be interviewed to know their perceptions about the system.

In addition, mechanisms should be implemented in the WWW to count the transactions among stakeholders. For example, that mechanism could count the number of comments about a specific subject. It would be interesting also to have usage statistics available to the users of the system.

In summary, this thesis explores the use of information technologies, such as the WWW, to facilitate public participation in EIA in Portugal. To take advantage of the WWW characteristics, this thesis provides a framework to design a WWW-based system to facilitate public participation in EIA in Portugal. Within this framework three approaches were proposed: the top-down dissemination model, the "watch-dog" model, and the interactive project formulation model. In the top-down dissemination model, a public agency uses the WWW as a way to disseminate EIA information. In the "watch-dog" model, diverse stakeholders use the WWW to disseminate their opinions about the information disseminated by the public agency. In the interactive formulation project model, the stakeholders use the WWW to present their perspective about the project in order to produce a collaborative EIS. This last model allows public participation to increase its influence in decision-making. Therefore, as a planner, one should strive to implement such a model to allow public's interests and needs to be incorporated in the project definition stage. However, the implementation of this model implies a change in the EIA process and its rationale.

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